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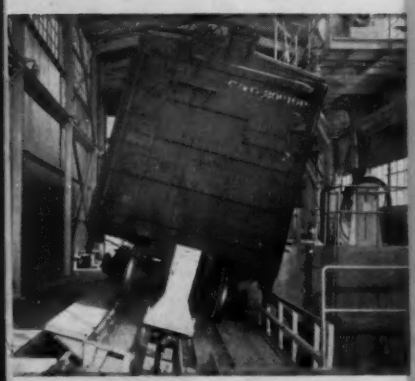

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ELECTRICAL WEST

April 1956
25 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

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what's the big idea?

LIVE BETTER...*Electrically*

LIVE BETTER ELECTRICALLY

COOKING IS SO FAST

Its cooking speed is one of the things you'll like best about an electric range. Foods cook to maximum goodness in minimum time.

WITH AN ELECTRIC RANGE

When you turn on the switch, fast intense heat reaches the desired degree in seconds and stays right there until the food is done to a turn. There's no waste and no waiting...just fast operation and perfect results.

Extra speed? Yes...and electric ranges are the ones with *all* the extras. See your dealer.

Good Service, Square Dealing, Edison *Courteous Treatment*

SOUTHERN CALIFORNIA EDISON COMPANY

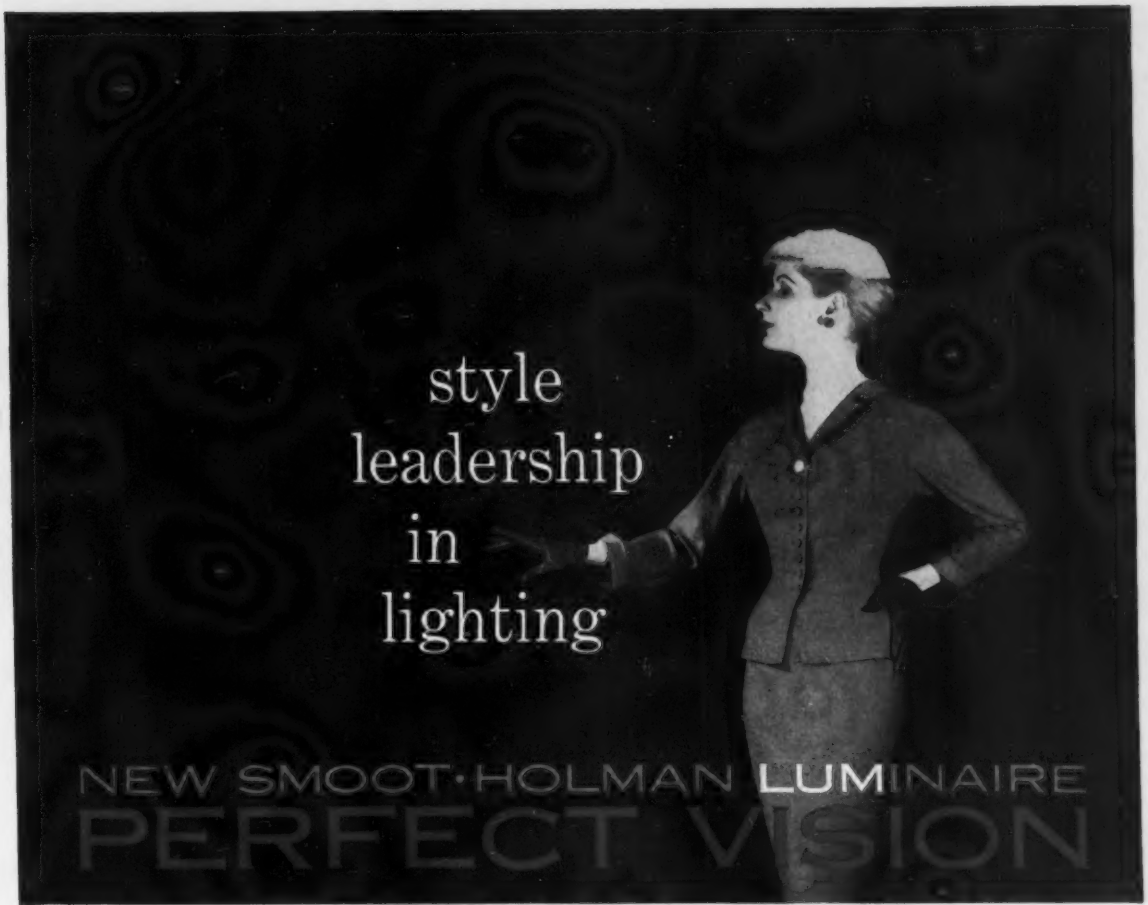
That's easy! For all of us in the electric industry, there is just one BIG IDEA. It is "Live Better–Electrically!" . . . theme of the industry's 1956 nationwide sales drive.

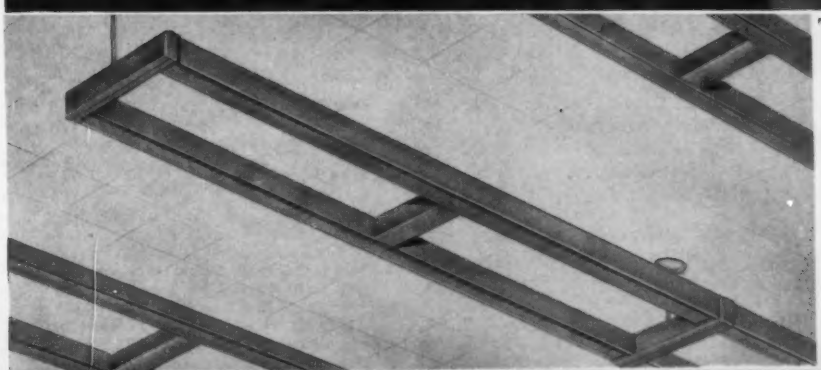
As you can see from the one shown here, Edison newspaper advertisements are getting into the act, starting right now. Right on through the duration of the campaign, they'll be telling the "Live Better–Electrically!" story to the people in your community.

Everywhere in Central and Southern California, alert appliance dealers will make it a point to tie-in with Edison advertising. Better living for your readers can mean better business for them and for you. *That* is part of the BIG IDEA!

SOUTHERN CALIFORNIA EDISON COMPANY

Good Service, Square Dealing, Courteous Treatment





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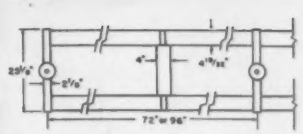

features:

- Utilizes new 800 MA high output lamps
- May be mounted within 12" of ceiling
- Meets ASA school standards
- High adaptation level with low brightness and brightness ratios
- Flexible in arrangement

Smoot-Holman continues its leadership in lighting with the "new as tomorrow" Perfect Vision indirect luminaire. Here again is Smoot-Holman quality, high efficiency and economy – actually gives *more light per dollar* than ever thought possible.

Investigate the many advantages of this exceitingly new, architecturally beautiful luminaire. Contact your local Smoot-Holman office or write direct for Catalog PV-288.

SMOOT-HOLMAN

Inglewood, California

WE SUPPORT THE NATIONAL LIGHTING BUREAU

SERVICE IN THE WEST AND SOUTHWEST FOR ALL SCHOOL, COMMERCIAL AND INDUSTRIAL LIGHTING

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

THE ALL-INDUSTRY MAGAZINE OF PROGRESS, ESTABLISHED 1887,
and incorporating the "Electrical Journal," "Journal of Electricity, Power and Gas" and "Journal of Electricity."

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Next Month

Personnel, management and supervisory problems will be the subject of the lead article for May. Other articles will cover experience with greased aluminum conductors and fittings, an all-aluminum welded substation, results of the annual Western snow survey, wiring and electrical features of the Equitable building in San Francisco and the Blue Cross building in Los Angeles.

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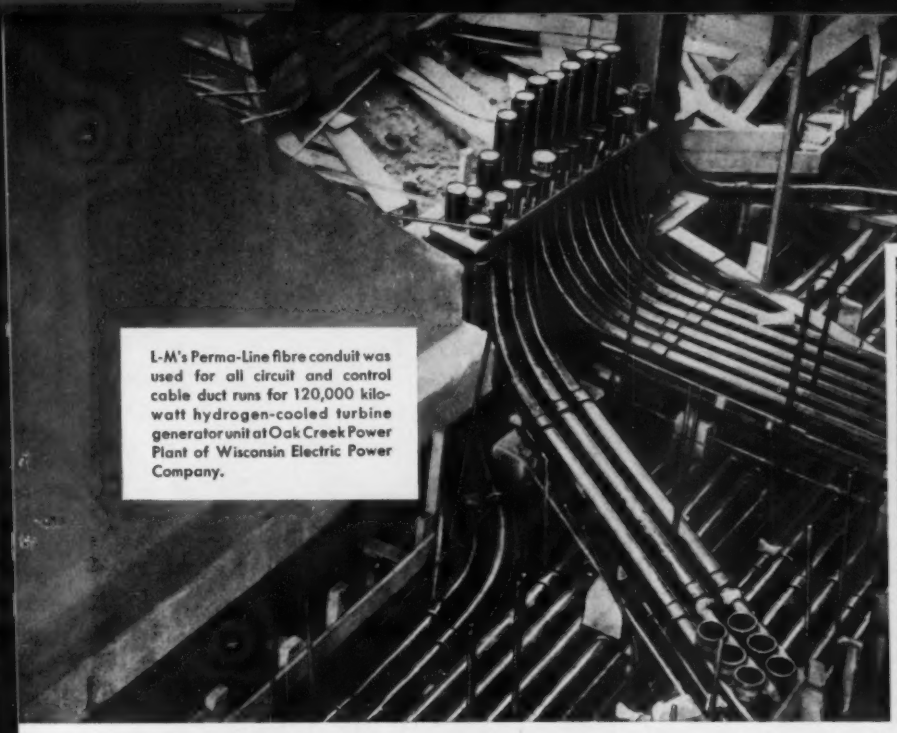
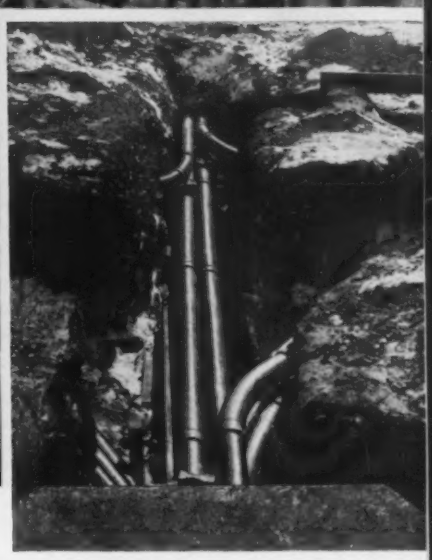


L-M's Perma-Line fibre conduit was used for all circuit and control cable duct runs for 120,000 kilowatt hydrogen-cooled turbine generator unit at Oak Creek Power Plant of Wisconsin Electric Power Company.



Above, L-M's Perma-Line fibre conduit is being installed in the Burleigh Substation, Wisconsin Electric Power Co. Duct has smooth inner bore and smoothly rounded bell ends in manholes so cable sheath will not be cut or marred.

L-M's Perma-Line™ Conduit Assures a Lifetime of Trouble-Free Service

L-M's Perma-Line fibre conduit is manufactured within close tolerances and according to rigid test requirements to assure trouble-free service for all generating station, substation, and underground system applications.

L-M's Perma-Line is corrosion-, vermin-, and leak-proof. It has an unusually high tensile strength. Joints are quickly and easily made by simply tapping the tapered coupling onto the tapered end of the conduit. Joints are watertight and safe from seepage of wet concrete and soil water. L-M conduit's smooth inner bore makes cable easier to pull and reduces cable sheath abrasion. Fibre conduit comes in long lengths. It's light, easy to handle; and you'll find it can be laid faster than many other types of ducts.

Complete Accessories

Prefabricated base and intermediate spacer units are available to keep installations rigid and evenly aligned. Spacers have special locking feature to make any combination of duct configuration.

L-M provides a variety of bends and angle couplings, including 5° angle coupling, S-bend, 45° and 90° bends. The 5° angle coupling provides for long radius turns and offsets; S-bend provides a 20" offset. Special bends are available on order.

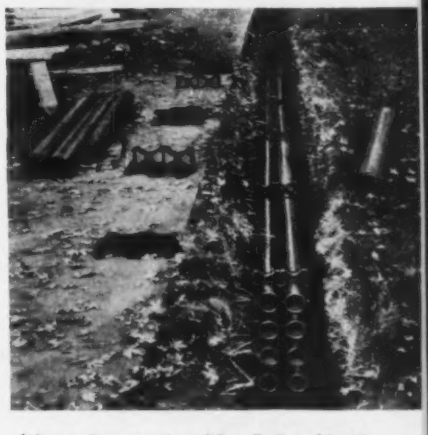
Bell ends for use at conduit terminals in manholes provide a smoothly rounded opening that will not cut or mar the cable sheath.

Fibre caps provide a watertight, vermin-proof seal for conduit lines prior to drawing cable. Easy to remove for reuse.

L-M Perma-Line fibre conduit is available in 5-foot lengths, sizes 2, 4, 5, and 6 inches; also 8-foot lengths, sizes 3, 3½, 4, 4½ and 5 inches.

Get Complete Information

L-M offers a completely engineered system for conduit installations. Ask the L-M Field Engineer for a copy of the 12-point plan folder, which shows how easy it is to use our system; also for L-M's underground construction handbook and Bulletin UG1A, which gives complete specifications. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



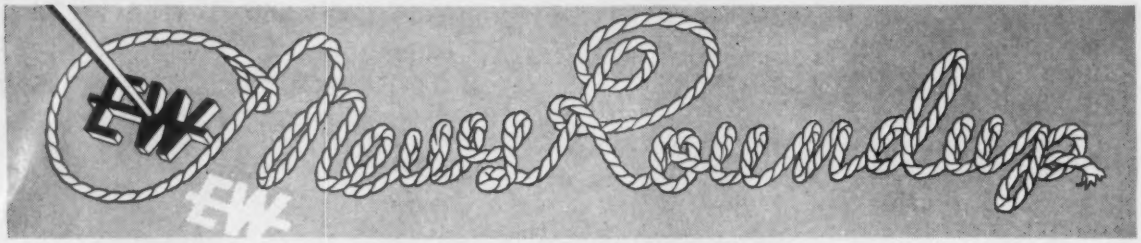
It is easy to construct a solid, well-aligned installation with L-M's Perma-Line fibre conduit and easy-to-use accessories. The illustration above shows use of L-M base and intermediate spacers, to assure firm, even spacing.

L-M's new tapering tool and fibre conduit vise duplicates the smooth, precision factory-cut tapers in the field. It pays for itself through savings from 100% salvage of field-cut ends.

LM® LINE MATERIAL

Fibre Conduit

226R



SIGNIFICANT ITEMS FROM THE EDITORS' NOTEBOOKS

BOTTLENECKS in Westinghouse Electric Co. production caused by the 156-day strike called by International Union of Electrical Workers are being eliminated as rapidly as possible.

Within 24 hours after agreement on a new five-year contract, workers were being absorbed into production lines and nine plants idled by the strike were again starting production of consumer products.

Westinghouse estimates that the strike cost 44,000 IUE employees about $74,000,000 in lost wages. Damages to the company have not been announced, but the company's annual report to stockholders shows a strike-caused loss of $1,037,000 or 9c a share for the last quarter of 1955.

The final contract was not too much different than the one turned down by the union last September, and is similar to those accepted by other unions in recent months.

Principal issue at the strike's outset was the length of the contract. Westinghouse wanted five years, the union wanted one year. The question was settled with a four-year extension of the present contract, which amounts to five years from the beginning of the strike.

The company also won the right to conduct time studies on any daywork or salary jobs for measuring or improving production and set standards. Grievance and arbitration measures are included.

Of 93 employees fired by the company for violence during the strike, 36 are indefinitely suspended from employment benefits. The union may file local grievances for reinstatement hearings and arbitration.

The agreement provides annual wage increases of approximately 3% over present rates, with a minimum of 5c an hour, with a second increase of the same amount on Oct. 15, 1956, and again on Oct. 14, 1957. In the final two years, an increase of approximately 3½% over present rates is effective Oct. 13, 1958, and Oct. 12, 1959. A cost-of-living provision calls for a pay increase of 1c an hour for each one-half point rise in the consumer price index raise over the 1955 level, with adjustment every three months throughout the life of the agreement.

While the company is striving to get production into full swing again, announcements have been made to customers waiting for equipment that orders will be expedited "in the shortest possible time."

Hardest hit by the strike was production of electric appliances, radios, television sets and lamps. Some plants, while not directly hurt by strikers, were affected by a lack of components from plants in more trouble.

Some plants will have production stepped up as much as 35% higher than prestrike levels in order to replenish inventories of dealers across the nation. This in turn will call for employment of more employees than were at work before the strike.

-EW-

After 10 years of planning, construction will start this month on the Los Angeles Furniture Mart, a $7,000,000, 12-story building at Broadway and Washington.

-EW-

THE GAY NINETIES will be revived to help San Diego Gas & Electric Co. celebrate its 75th anniversary this spring.

Exhibits and a 22-minute movie will recall the past—bring customers up-to-date on today's services.

Iron grill work, an old gas chandelier, replica of an Edison lamp, a 50-hp generator used in the 1880s, are all among the relics to be displayed at the San Diego Bureau's Spring Fair in April.

After a flashback to early days, the movie shows the complexities of today's operations; what the customer gets for his money; different kinds of equipment needed to serve him.

San Diego G&E was organized as a gas company and added electricity in 1887, eight years after Edison developed the incandescent lamp. Founding Day, April 18, will be the occasion for birthday parties at headquarters and in district offices, with cake and coffee and a special edition of the *News Meter*.

-EW-

Many beautiful annual reports are coming through the mails these days, which leads to a comment on the unusual—and attractive—one turned out by Arizona Public Service Co. They have done a take-off on the popular newspaper magazine sections, complete with full color, picture stories—and the financial statement, of course.

-EW-

We have to report that Bonneville's loud noise about 20-year wheeling agreements with nonfederal, nonpublic agencies a few months ago have turned into an embarrassed squeak. A justice department ruling makes congressional approval for such arrangements necessary.

-EW-

"I can think of no more appealing task in public life today than to bring before the people of Oregon this opportunity to choose between honor and the objectives of the Eisenhower administration, and the slippery philosophy of Wayne Morse."—**Douglas McKay.**

-EW-

CHALLENGE—One of the most interesting political contests in years is in the making. Douglas McKay has stepped down from his Interior post in the Cabinet in time to go into training for the race against Sen. Wayne Morse for Oregon's senatorial seat.

Federal power policies can't help but be a major topic of the campaign.

The battle will be fought in an arena

The "Blue Ribbon", resistor with a higher wattage rating per unit space requirement. Made by Hardwick, Hindle, Inc., Newark, N. J.

because of DRIVER-HARRIS 146 ALLOY

Here is a resistor really new and different . . . the compact Hardwick, Hindle "Blue Ribbon," which stands remarkably high overloads and excessive heat without crazing.

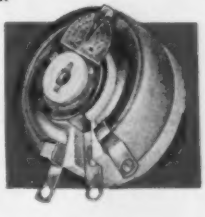
Special design features which make this possible are: an aluminum thru-bar extending through the center of the elliptical ceramic core, which insures a more even distribution of heat to prevent "hot-spots;" and a thermo-shock-proof enamel coating which eliminates crazing.

Heretofore, crazing, which occurred mostly at *terminal* areas, shortened resistor life and limited the safety factor. To prevent this, an alloy with three hard-to-find qualities was needed: (1) It had to have a coefficient of expansion to match all integral parts; (2) it had to be free of gas; (3) it had to form a perfect bond with the enamel.

A large order, indeed. But Driver-Harris filled it by developing #146, a glass-to-metal sealing Alloy. This alloy now makes it possible to operate resistors and rheostats at hitherto dangerous overloads, with no risk of breakdowns in the enamel coatings.

146 Alloy is one of 4 Driver-Harris Alloys which cover most glass-to-metal sealing needs—available as rod, wire, strip, sheet foil, and in special shapes. Today the makers of the "Blue Ribbon" use 146 Alloy for the terminals in all of their resistors and rheostats as well. They also use Nichrome*, Advance*, and other gas-free resistance alloys made by Driver-Harris in winding the cores.

What you can learn from this is clear. If you also need a special purpose alloy, send us your specifications. Our engineers with 48 years of experience are at your service.



One of a new line of "H" Series high wattage rheostats made by Hardwick, Hindle, using Driver-Harris Alloys.

Nichrome and Nichrome V are made only by

SPECIAL PURPOSE ALLOYS SINCE 1870 — D/H — TRADE MARK REG. U. S. PAT. OFF.

Driver-Harris Company

Western Representative: **ANGUS-CAMPBELL, INC.**

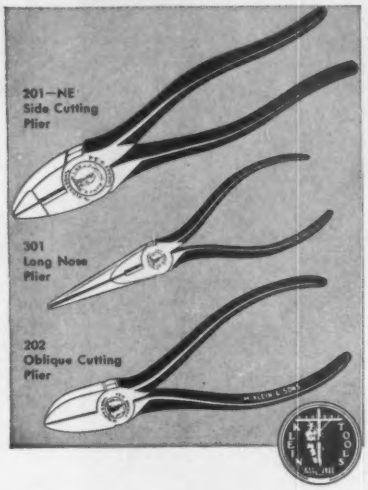
4417 S. Soto St., Los Angeles 58 917 Bryant St., San Francisco 3

Main Office and Plant: HARRISON, NEW JERSEY

*T. M. Reg. U. S. Pat. Off.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

KLEINS



Standard of the Industry for Nearly a Century

Ask the lineman on the pole . . . the electrician at the switchboard. They will tell you that the pliers they rely on are Kleins—every time.

Kleins have been serving the electrical industry since the first wires were strung and today have the same high quality, the same fine craftsmanship, the same individual inspection and testing that have won them their place for a century as first in pliers.

A wide variety of sizes and styles to meet any need . . . but only one quality—the highest.

ASK YOUR SUPPLIER

Foreign Distributor:
International Standard Electric Corp.
New York

New Plier Display

Speed up Klein Plier sales with this new display board. Write for price and full information.

Mathias KLEIN & Sons
Established 1857 Chicago 31, U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

where the votors have had a chance to observe both power philosophies in action. The contestants both have a great popular following in the state.

Sidelight: Pundits have it that considerable White House influence will be exerted on behalf of the contender in hopes of upping the narrow Republican majority in the Senate.

-EW-

HOLD-UP? — The Senate interior committee has adopted a resolution calling for payment of $5,000,000 to the Crow Indians for rights-of-way and land needed for Wyoming's Yellowtail Dam. The Montana *Standard* reports the land in question was worth $35,000 five years ago.

Incidentally, Robert Yellowtail has refused to tell the same committee who offered him a $20,000 bribe to quit fighting construction of the dam.

A Crow Indian mother is not so reticent. She told the committee she opposes the dam because it would increase juvenile delinquency and drunkenness.

-EW-

PEAK AHEAD—The U. S. Department of Commerce announces that 1956 very likely will set an all-time record for new industrial and commercial construction.

The figure projected by the department is $35 billion, 22% above that of 1955. Of this amount new plant equipment will account for $15 billion, commercial structures $10 billion, and utilities $5 billion. The balance is made up by miscellaneous segments of the business structure.

-EW-

REVISION—A rate increase, the first in 36 years, is being sought by the Los Angeles Department of Water & Power. The proposed new rates are expected to produce an increase of 5.9% in total revenue or about $4,800,000 in the next fiscal year. Cost to the average domestic customer, however, would be about 25c per month.

The requested rate increase is one of two steps requested by the department to insure an adequate basis for financing its operating needs and providing the new facilities for rapidly growing power requirements in Los Angeles. The second step seeks an amendment to the city charter which will raise the present limit on the amount of revenue bonds that can be issued.

Under current policy, the department finances new construction of electrical facilities by obtaining half its funds from retained revenues and the balance from revenue bonds.

AUTOMATION SUMMARY—Turn to page 77 for one of the most informative articles on the controversial subject of automation that has yet been published.

It's informative, interesting reading, and thought-provoking. It summarizes the social and economic aspects of automation as well as describing some of the almost incredible technological developments htat have already passed into the production stage.

We think it is an article you will remember and discuss for a long time.

-EW-

TAKE-OFF POWER—McGraw-Hill's excellent Economics Department sometimes comes up with items not strictly germane to business forecasting. For example, it tracked down a rumor that some of the present-day motor vehicles have nearly as much horsepower per pound as is built into a DC-7 or Super Constellation.

Their findings: pound for pound, two-thirds as much horsepower is packed into some of our standard passenger automobiles as there is into the fastest transport planes. The ratio of pounds to horsepower on a Buick Century is about .063; in a DC-7 about .093.

Maybe that advertisement for gasoline that said "It puts wings on your car" is not so far off after all.

-EW-

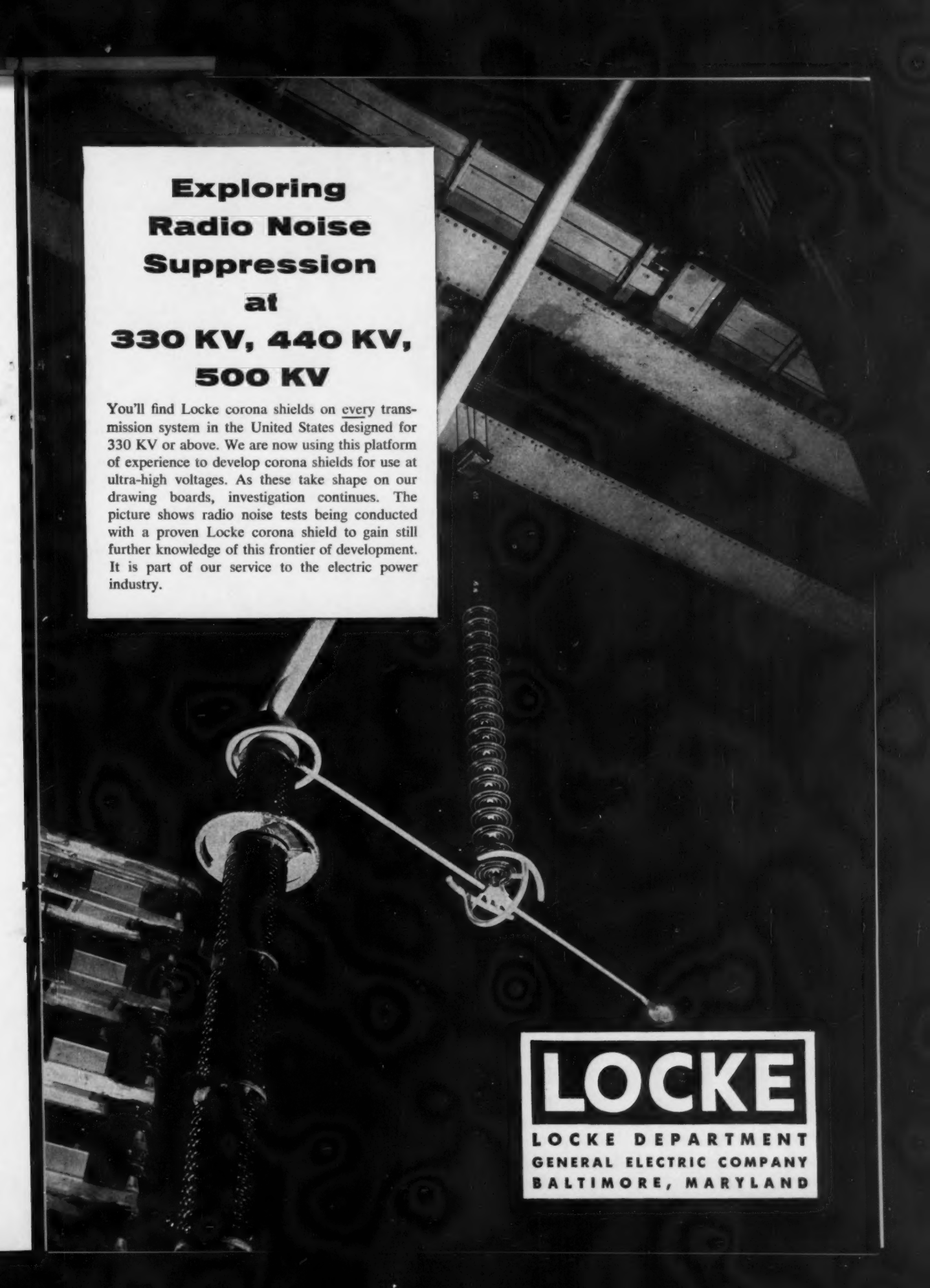
Something about the timing of State Attorney General Thornton's "criminal action" (see p 142) against two Oregon utilities smells like political gunsmoke from here. Asked for a ruling weeks before, he waited until Portland General gave the "go" sign to a contractor before he sent a district attorney to the Pelton site to see if construction had started "illegally." Thornton and Sen. Wayne L. Morse are both Democrats.

-EW-

ELECTROCHEMICAL CELLS as energy converters operating on natural or processed fuel (fuel cells) offer a possible alternative method of generation and might also be used for energy storage on a larger scale than is now economic with secondary batteries.

This prediction was made by A. M. Adams, Central Research Laboratories, Leatherhead, Surrey, England, before the winter general meeting of the AIEE in New York.

Adams thinks there is little prospect of fuel cells making any significant


Exploring
Radio Noise
Suppression
at
330 KV, 440 KV,
500 KV
You'll find Locke corona shields on every transmission system in the United States designed for 330 KV or above. We are now using this platform of experience to develop corona shields for use at ultra-high voltages. As these take shape on our drawing boards, investigation continues. The picture shows radio noise tests being conducted with a proven Locke corona shield to gain still further knowledge of this frontier of development. It is part of our service to the electric power industry.
LOCKE
LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

FANNER
Superformed
LINEGUARDS
provide lowest cost protection on SHORTSPAN CONDUCTORS

Fanner Superformed LINEGUARDS give short span distribution lines complete protection against abrasion, arcover, or clamp or tie wire damage at lowest possible cost. They have the same features of ease of installation, lasting durability and reuseability as Fanner ARMOR RODS, but are smaller in wire size and shorter, therefore cost far less: It's good economy to use Fanner LINEGUARDS on short spans with low tensions (1) at support points to protect against clamp or tie wire damage, (2) to provide a protective layer for tapping purposes, (3) at expulsion-gap or other critical locations. Further information and prices on FANNER Superformed Lineguards will be furnished on request. Write today.

Other FANNER ELECTRICAL LINE PRODUCTS

ARMOR RODS

- For protection against vibration damage and also good for emergency repairs on partially broken overhead lines.

PATCH RODS

- Act as a "repair sleeve" for conductors having up to about ¼ of the wires broken in the outer layer.

TAP ARMOR

- Provides a protective layer of shortened rods on conductor for making taps without risking damage to conductor.

PLASTIC FANNGUARDS

- Tough, durable spiral wound plastic sleeves that snap together over covered wires and cables to provide protection against tree abrasion.

Licensed for use under Patent No. 2,275,019

THE FANNER MANUFACTURING CO.
Electrical Products Division
Brookside Park Established 1894 Cleveland 9, Ohio

Fine Fanner Superformed

AGENTS IN PRINCIPAL CITIES

contribution to electrical supplies in the next decade, but said it does seem possible that the Bacon high-pressure hydrogen-oxygen cell will probably be used for rail traction in a few years.

Electrochemical cells might be employed to convert heat, for instance, from a nuclear reactor, directly into electrical energy, he said. Fuel cells using solar energy may be developed, he said, and could possibly compete with diesel generators in a mobile power plant.

-EW-

Just in case Tacoma City Light should find a way around the old navigation law that threatens its Cowlitz project, the Washington State Sportsmens Council is prepared to present an initiative to voters. It would ask for a law to prevent municipalities from constructing dams within the Cowlitz River fish sanctuary established by the legislature several years ago.

-EW-

SPENDING BOOM? — Judson S. Sayre, president of Norge, told investment bankers last month that there's $10 billion worth of extra consumer spending available for soft goods and shelter goods this year.

This increase in consumer discretionary spending power opens up new growth possibilities for the home appliance industry which now ranks third (behind autos and homes) as the largest item in consumer durable goods purchases.

-EW-

The U. S. production of electric energy by utilities topped 51,000,000,000 kwh in January—up 16.3% over January of '55 and a new all-time monthly record. . . . The stock market pierced the 500 mark on the Dow Jones averages last month. Many economists believe that the market has reached another plateau—that a boom and more inflation may be in the making.

-EW-

"NEGLECT OF ENGINEERS to fulfill their obligations to society is one of the reasons past civilizations have fallen."—Morris D. Hooven, president, AIEE.

This is an engineer's world. Within sight is the possibility of creation of

Greater public safety...at new low cost to you

Hubbard's new Glo-Guard Guy Protector

Now you can get added protection for the public at a new low cost . . . with Hubbard's *Glo-Guard* Guy Protector. *Glo-Guard* has the added feature of luminous areas that reflect brightly in headlight glare. And the *Glo-Guard* is easily visible on dimly lighted streets or poorly lighted areas to warn pedestrians of dangerous projections.

Hubbard's new *Glo-Guard* Guy Protector is available in two lengths, 7 feet (Stock No. 718) and 8 feet (Stock No. 818). Attachment holes and clips are spaced for mounting on guy wires, rods or clamps at any height. It is formed from Cor-ten steel for long life and high strength.

Glo-Guard is the latest addition to Hubbard's complete line of Guy Protectors. Also available is Hubbard's *Loxfast* Guy Protector. With only one bolt to tighten, the *Loxfast* is designed for fast installation and long years of service. *Loxfast* is available in 7 foot lengths (Stock No. 7657 Light and Stock No. 27657 Heavy) and 8 foot lengths (Stock No. 7658 Light and Stock No. 27658 Heavy).

Another Protector, popular with utilities, is Hubbard's *Half Round* Guy Protector. Edges of the *Half Round* are turned in for greater rigidity and safety. The *Half Round* is also available in two lengths, 7 feet (Stock No. 7557) and 8 feet (Stock Number 7558 for two bolts and Stock No. 7559 for three bolts).

For information on Hubbard's complete line of Guy Protectors, please contact your nearest distributor or Hubbard and Company, 6301 Butler Street, Pittsburgh 1, Pa.

HUBBARD AND COMPANY

Pittsburgh 1, Pa.
Chicago 50, Ill.
Oakland 8, Cal.

a physical utopia—a civilization constructed on a technology which has learned to grow upon itself.

"Among the most privileged inhabitants of this new civilization is the young electrical engineer on whom falls the burden of handling an increasingly complex technology."

-EW-

Seattle's City Light got the go-ahead from the Federal Power Commission to raise the existing diversion dam at the intake of its Gorge hydro plant to an elevation of 880 ft above sea level. Turbines in the Gorge power house will be modified to increase their capacity by more than 40%.

-EW-

GHOSTS—The little motor that isn't there is the creation of Minneapolis-Honeywell test engineers.

Real motors used to test the company's switches and relays wore out faster than the equipment being tested. So the department dreamed up an ingenious arrangement of resistors and inductors that duplicate the electrical behavior of a real motor—*only the device doesn't wear out because it has no moving parts.*

-EW-

New Zealand is studying the possibility of linking the rich hydroelectric power resources of its South Island with industrial North Island by means of a submarine cable across Cook's Strait. An entirely new type of undersea cable is contemplated to handle the large amounts of power available in the south and needed in the north.

-EW-

STUDY DISTRIBUTION—Top utility executives should give distribution problems, especially residential, their personal attention, says J. H. Jewell, Westinghouse.

They should direct their engineers to make special studies of their own distribution systems and investigate all solutions that have been suggested to meet the greatly increased loads of the future, Jewell says.

From his study of the problem he feels that secondary distribution at 240/480 v will prove the most economical solution.

Built-in, heavy-duty appliances would be served at the higher voltages. Lighting and portable appliances would be served at 120 v by a dry-type autotransformer in the home.

Preliminary studies indicate savings as high as 26 to 30%, according to Jewell.

-EW-

NEW SOURCE—Large areas of the lignite beds of western North and South Dakota have been found to contain uranium-bearing lignites.

Present extraction processes do not lend themselves to recovery of the atomic material, so a privately financed pilot plant is to be built at the Colorado School of Mines to determine if practical extraction processes can be developed.

Success in this direction might provide a significant new reserve of fissionable material in an area that military experts might well characterize as "strategically invulnerable."

-EW-

Shortage of engineers has created a buyer's market, said J. D. Ryder, dean of engineering, Michigan State, in advising utilities, in particular, to change their recruiting methods in colleges. He recommended that utilities, in order to get the better graduate, look at their pay scales, make their work more interesting and creative, and institute research programs.

-EW-

BOUQUETS to Electrical Products Consolidated Co. of Seattle. For the third time in five years it has been awarded the Corning Trophy, the top award for excellence in electrical advertising design.

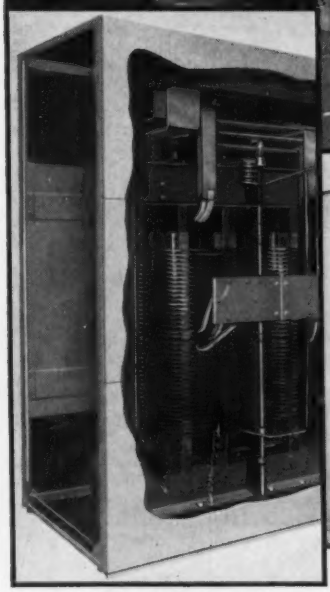
The $1,000 cash prize was divided between artists Robert Hietala and G. Wells Balcom of the electrical products staff.

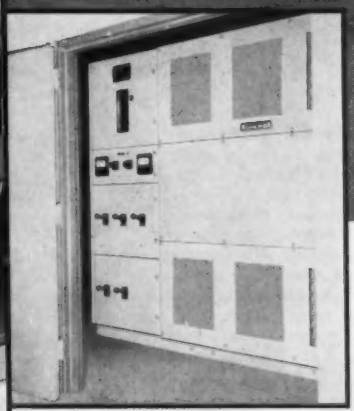
Donor of the trophy (a Steuben glass cup) is Corning Glass Works.

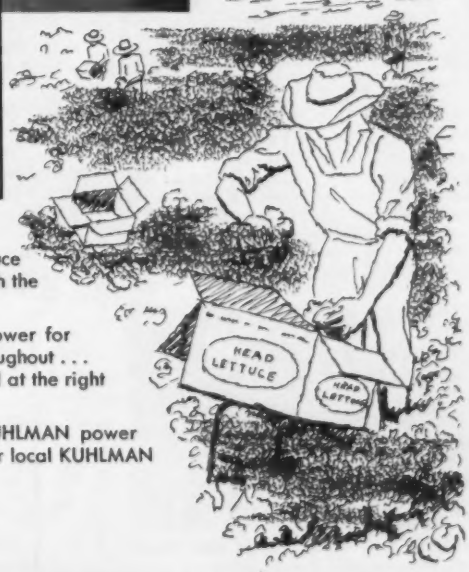
-EW-

REMINDER — Make reservations now for: RMEL Spring Conference, April 29-May 1, Shirley-Savoy Hotel, Denver; NECA, Districts 6 & 8 conference, Hotel Utah, Salt Lake City, May 3-5; NWPPA Engineering & Operating section, Wenatchee, May 10-12; PCEA annual convention, Las Vegas, May 14-16; NWEL&PA Business Development section, Seattle, May 21-23; NWEL&PA Personnel and Safety section, Seattle, May 21-23 (meetings are separate except for one session and a luncheon).

progressive california lettuce industry SELECTS KUHLMAN POWER CENTER TRANSFORMERS







Packed in cartons in the field and refrigerated . . . California lettuce reaches any part of the world as fresh as the day it was picked . . . with the help of KUHLMAN power.

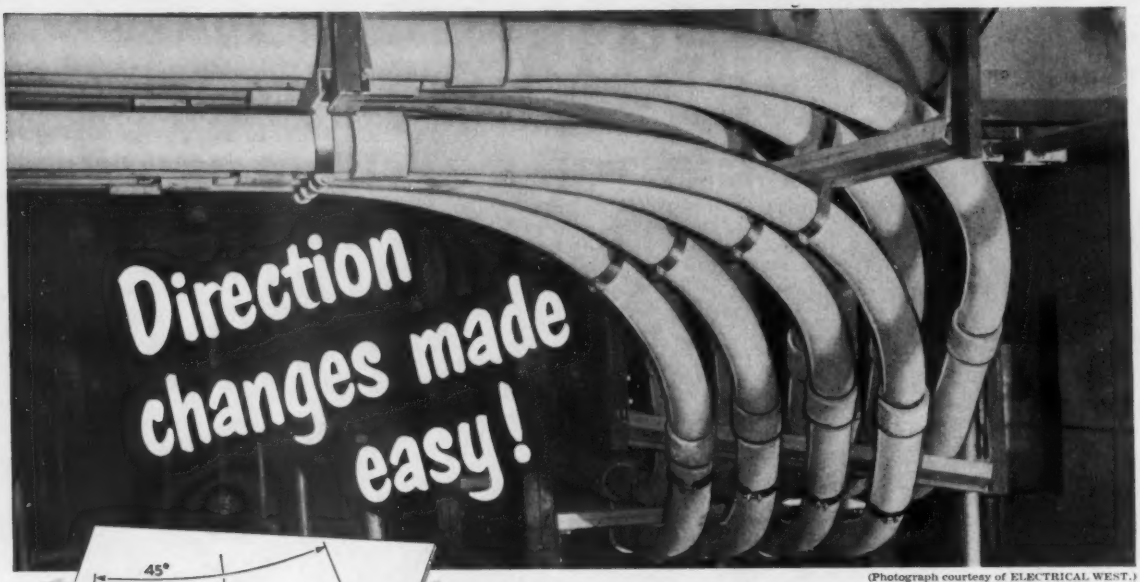
The KUHLMAN 750 KVA power center, illustrated above, supplies power for one of California's ultra-modern lettuce packing plants. KUHLMAN throughout . . . a network of small dry type transformers puts power where it is needed at the right voltage for each carton manufacturing operation.

Specify KUHLMAN for your plant modernization . . . you'll find KUHLMAN power centers can meet your special requirements. Get all the facts from your local KUHLMAN representative.

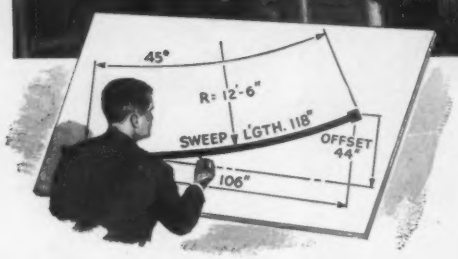
KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

DISTRIBUTED BY MAYDWELL & HARTZELL, INC. Seattle • Spokane • Portland • San Francisco • Los Angeles • San Diego • Phoenix



(Photograph courtesy of ELECTRICAL WEST.)



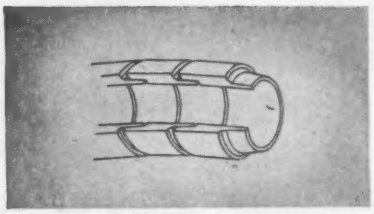
. . . with standard fittings for TRANSITE *asbestos-cement* DUCTS

When you use Transite Ducts, you have available a wide variety of standard fittings, made of the same asbestos-cement material as the ducts themselves. These fittings save time and expense because they provide maximum flexibility in laying out or constructing a duct system. They facilitate clearing unexpected obstructions or accommodating revisions in the original layout.

For instance, the new Transite 5° Bend Segments (shown at left) can be used alone to form simple and complex curvatures of any multiple of 5°. Used with other standard Transite curved fittings, they form curvatures of odd degrees. Thus, they enable you to simplify cross-overs and transformations . . . to clear obstructions . . . to form unusual or special bend or offset sections. They eliminate the need for purchasing special radii bends or sweeps.

The other standard Transite fittings that facilitate directional changes are the offset bends, standard 45° and 90° bends, sweeps, curved segments, laterals, tees, elbows and deflection couplings. These fittings are machined to a standard taper so that they can be used with Transite Conduit, Transite Korduct or with other Transite fittings.

For more information, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, address 199 Bay Street, Toronto 1, Ontario.



5° bend segment sketched in detail. It consists of a straight section of Transite stock with a male taper on one end and a female taper on the other . . . each machined at an angle of 2½° to the center axis. Segments can thus be used single, or combined to form bend sections whose curvature is any multiple of 5°.

Photograph showing use of bend segments and curved segments with Transite Ducts.

5 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

1. **Corrosion-Resistant.** Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.
2. **Permanently Smooth Bore.** Transite makes long cable pulls easy, under any conditions. Danger of damage to cables is also minimized.
3. **Incombustible.** Transite will not burn or contribute to formation of smoke, gases, fumes. It confines burnouts, will not soften under heat.
4. **Higher Thermal Conductivity.** Cables run cooler in Transite, reducing I^2R losses, increasing current capacity and prolonging insulation life.
5. **Easy to Install.** Transite Ducts are light weight, easy to handle. Joints are quickly made. Long 10-foot lengths reduce number of joints in line.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE® DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

OVER 400 RATINGS

Select Your Instrument Transformer Needs from Wide Range of Types

Get top quality, wide selection, quick delivery from Allis-Chalmers! Select dry-type, oil or compound-filled units, depending on transformer rating, application and location indoors or out.

Features include liberal electrical design on all types. High voltage types incorporate corona-free design. All Allis-Chalmers metering transformers have high accuracy.

Get Dimension Sheets

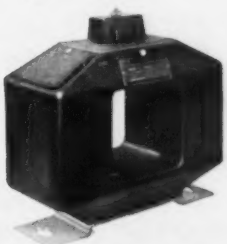
All pertinent mechanical and electrical information is in convenient data sheets. It is yours for the asking. Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Outdoor current transformer, type KO, rated up to 15 kv, 800 amp.

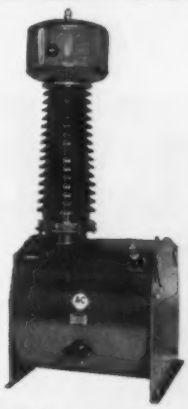
Molded current transformer, type BKM for 1200 and 1500 ampere indoor or outdoor use, 600 volts.

Molded current transformers, type TWM for 200, 400, 600 and 800 ampere, indoor or outdoor use, 600 volts.

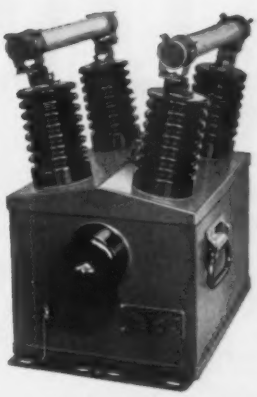
Oil-insulated outdoor current transformer, type SCW for 25 kv to 138 kv.



Molded current transformers, type BKM for 2000, 3000 and 4000 ampere application, 600 volts.



Oil-insulated outdoor potential transformer, type SPW for 25 kv to 138 kv.



Indoor potential transformer, type PD, rated up to 14,400 volts, fused or unfused.

A-4958

ALLIS-CHALMERS

"... will require
the utmost cooperation
of all of us"

"Our industry has made gigantic strides in the last decade. But, bright as the picture is, there is still a tremendous job to be done. The Live Better Electrically program provides a way to accomplish this job realistically on a national basis. It will require the utmost cooperation of all of us. If we can put this across ... this broad concept of Live Better Electrically ... all segments of our far-flung interests will benefit economically. And, what is more important, the entire nation will be enriched with the opportunity for better living, easier living, happier living."

How electric utility companies are LIVE BETTER...

Today, over 200 electric utility companies are actively participating in the Live Better Electrically program. On February 8, over 80 of these companies sponsored the Live Better Electrically closed-circuit television show and invited their trade allies in 76 cities to attend. On that afternoon in February, the show was seen by an audience (and a selected audience!) of over 30,000 people.

Two hundred kinescope (film) prints of the show have been distributed for later showings by utility companies, and it is estimated that these will have an audience of a quarter of a million viewers.

Many utility companies are already using the Live Better Electrically theme and symbol in their advertising. Some

Harllee Branch,
President, Edison
Electric Institute

backing Electrically

have used it on their annual report. Reports have been enthusiastic, and demand for advertising materials has exceeded even the most optimistic plans. Some utility companies have revamped their entire advertising schedule in order to make fuller use of the Live Better Electrically theme. Others have bought time on radio and television to identify their company with the Live Better Electrically movement. The success of the Live Better Electrically campaign depends, in great measure, on co-operative effort. These utility companies working for, and getting the cooperation of, trade allies in their local areas will reap the greatest rewards.

HERE ARE THE WAYS YOU CAN ENLIST THE SUPPORT OF YOUR LOCAL TRADE ALLIES

Conduct regular Live Better Electrically sales and information meetings with dealers, contractors, builders and other local trade allies.

Make wide distribution of all Live Better Electrically promotion materials—banners, window streamers, posters, counter cards and direct-mail pieces.

Suggest truck signs, letterheads, business cards, postage-meter slugs incorporating the theme.

Distribute copies of book "How to Help Home Owners Live Better Electrically" to trade allies.

Supply trade allies with copies of consumer book "Step-by-Step Ideas to help you Live Better Electrically."

Mail copies of 8-page booklet entitled "The Story of Live Better . . . Electrically" to your trade allies.

Use prepared radio and television commercials on your local stations.

Supply your trade allies with prepared newspaper advertising mats in various sizes.

New CURTIS SQUARE RECESSED INCANDESCENT SERIES

For 100, 150, 200 and 300 Watt Lamps, with flush or flange type hinged door construction

Accommodates a variety of glass lenses or a patterned louver

These new Curtis square recessed units are efficient downlights for accent, supplementary and general lighting in residential and commercial areas. Both flange and flush types can be recessed into a 12" opening in any type new or old ceiling construction, by means of special Curtis mounting support brackets. Curtis square recessed units have a new patented* door and frame construction. The door is a die-casting of light metal finished either baked white enamel or heavy chrome plate. The hinges are completely concealed and no screws, catches or fasteners are used to close the door, or detract from the appearance of the frame.

The outer housing is of heavy gauge, steel finish, baked black enamel. The contour and design of the reflector directs the maximum amount of light through the lens. It is specular finished Alzak Aluminum after forming.

All units are listed by Underwriters' Laboratories, Inc. for installation singly, in groups or patterns. Write Dept. D16-SR for descriptive literature. Serial No. 2433.

PAT. No. 2,701,840.

Simple adjustment centers light source of various lamps for maximum output.

FOR 300 WATT LAMP

The unit comes factory assembled for use with a 300 Watt, medium base lamp mounting plate and socket in this position.

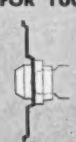
FOR 200 WATT LAMP

Move lamp socket from the outside of the mounting plate to this position. Mounting plate remains in same position as factory assembly.

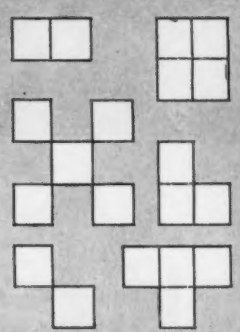
FOR 150 WATT LAMP

Assemble the mounting plate with drawn side toward inside of housing with the lamp socket attached to the outside of the mounting plate.

FOR 100 WATT LAMP

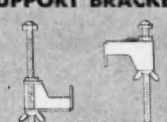


The drawn side of the mounting plate is positioned toward the inside of the housing with the lamp socket to the inside of the mounting plate.

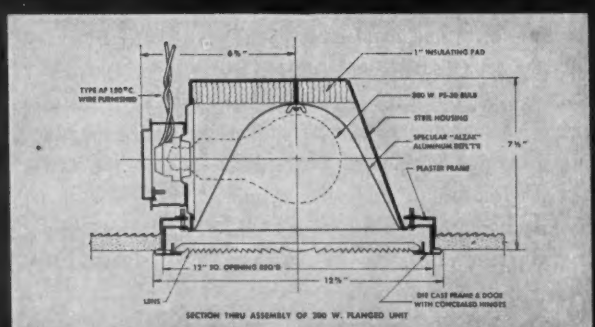


Flush type units may be grouped together forming 12" x 24" patterns; 24" x 24" patterns as well as various designs such as L's, T's, X's or V's.

NEW MOUNTING SUPPORT BRACKETS



These unique brackets are designed to permit easy, quick installation in "T" bar, "U" channel or wood frame ceiling construction. The brackets may be used with prong down or up.

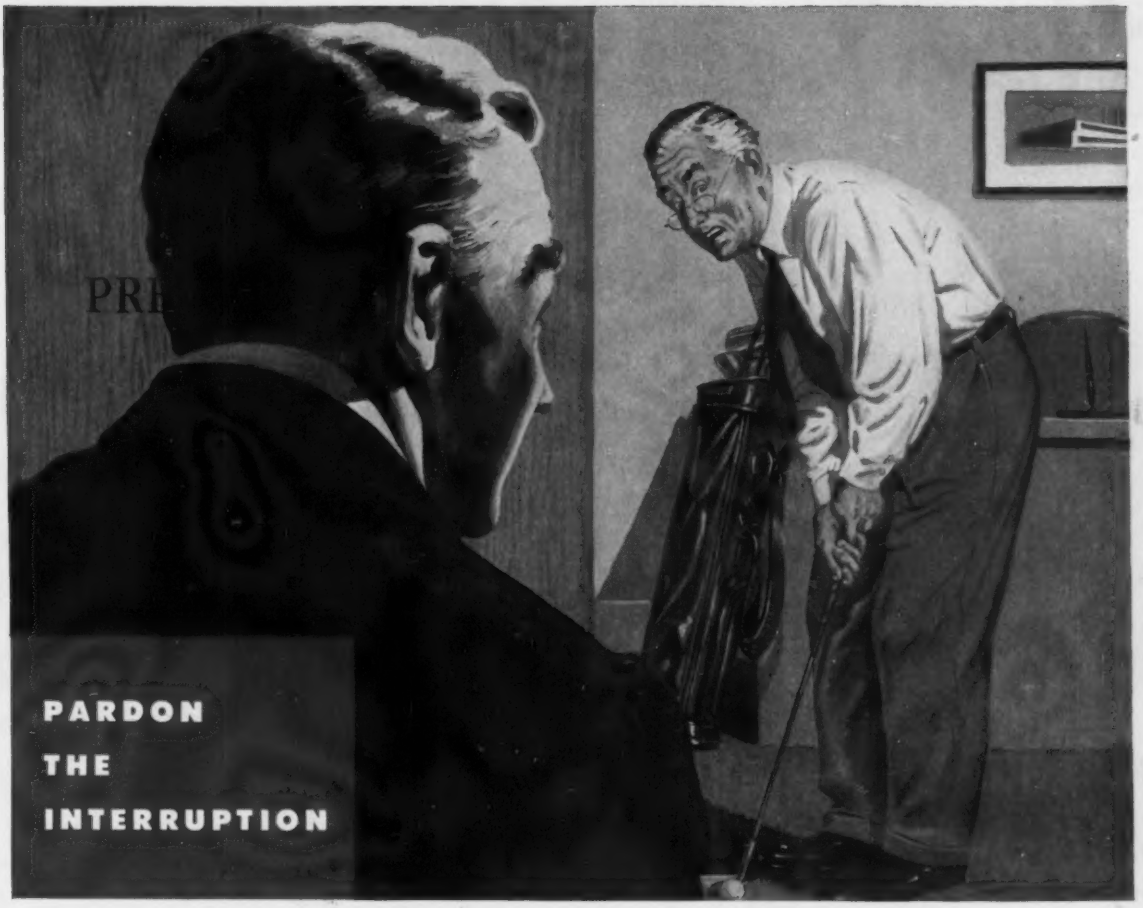


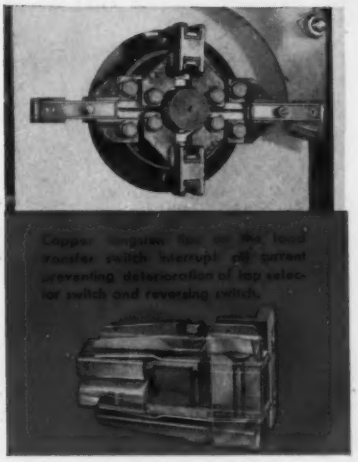
SECTION THRU ASSEMBLY OF 300 W. FLANGED UNIT

CURTIS LIGHTING, INC.

6135 W. 65TH STREET
CHICAGO 38, ILLINOIS

IN CANADA
Curtis Lighting of Canada, Ltd.
195 Wickstead Ave.
Leaside, Toronto 17, Ont., Canada





Interrupting electricity is just like interrupting the boss. No matter how you do it, it's a touchy situation. Electricity, when interrupted, presents a touchy situation, too!

Yet the primary function of Moloney Load Tap Changing Transformers is interrupting . . . switching to various taps . . . and the load tap changing equipment must bear fully the brunt of the destructive power unleashed with each break in current flow.

That's why Moloney uses switch contacts . . . for all current interrupting duty . . . made of a combination of copper and tungsten that conducts electricity best while successfully resisting arc erosion.

All this, plus the minimum arcing duty required of Moloney load tap changing equipment means greater durability, longer life and overall transformer dependability . . . for your utility system.

Specify Moloney . . . Get Dependability at its Best.

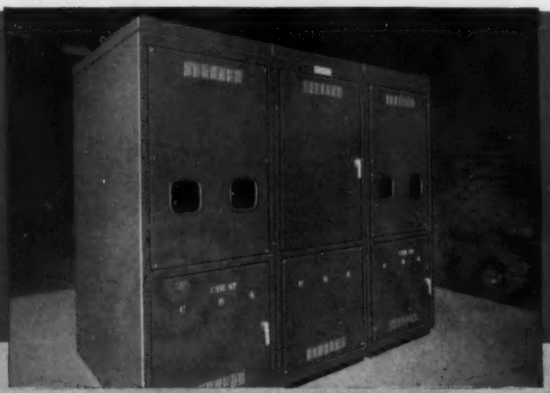
MEB3-47

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Magnetic Components for Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Now... metalclad primary gear for ...in one Low Cost



SIMPLIFY PREFERRED-TO-EMERGENCY SWITCHING WITH

S&C's new "Package" approach

Here is a simplified solution to the demands for uninterrupted service . . . a complete throw-over "package" that overcomes the disadvantages of previous methods that were unsightly, costly, and complicated. S&C's new package is compact, economical, and completely enclosed—ideal for distribution and industrial substation applications.

LOW COST—Standardized design and factory assembly techniques provide substantial savings. The entire system is factory tested and ready to set into place . . . no costly on-the-site construction, assembly, or check-outs to make.

SAFE—The tamper-proof metalclad unit prevents access to unauthorized persons. Thus it is suitable for residential and industrial areas.

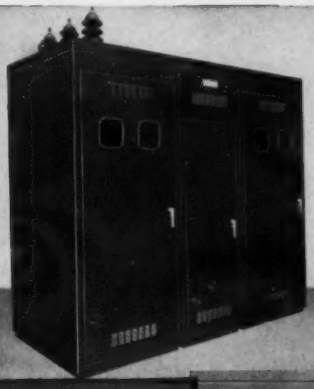
ATTRACTIVE APPEARANCE—All sensing, switching, and protective devices are enclosed in a metalclad unit. There are no ugly motor-driven, pole-mounted switches. Simple lines, neutral finish, and compact, streamlined construction are in keeping with the planning of today's residential and commercial neighborhoods.

15-CYCLE AUTOMATIC THROW-OVER—Throw-over in case of an outage is accomplished in about 15 cycles or less, rather than the several seconds required with motor mechanisms.

FULL LOAD INTERRUPTION—S&C Load Interrupter components permit the entire load to be dropped at any time under any conditions except short circuit.

throw-over schemes

Package



A TYPICAL S&C THROW-OVER PACKAGE

Super-Durabake Finish is beautiful and long lasting . . . prevents rust and minimises maintenance.

S&C Power Fuses protect transformer primary whether supplied by preferred or emergency source.

S&C Load Interrupter on preferred source opens on power failure.

S&C Load Interrupter on emergency source closes on power failure.

S&C Gear is a complete package ready for service. Just make up the potheads . . . no on-the-site engineering, assembly or testing required.

Potential Transformers sense both preferred and emergency sources . . . transfer occurs only if there is voltage on the alternate source. (Secondary sensing is optional.)

Control Panel and Operators (at rear of center section) provide for load transfer to an emergency source of power when there is a loss of voltage on the preferred source. With economical semi-automatic spring operators, the load is returned manually at the convenience of the operator. With optional hydraulic operators, back transfer occurs either when preferred voltage is restored or when a loss of voltage occurs on the alternate source.

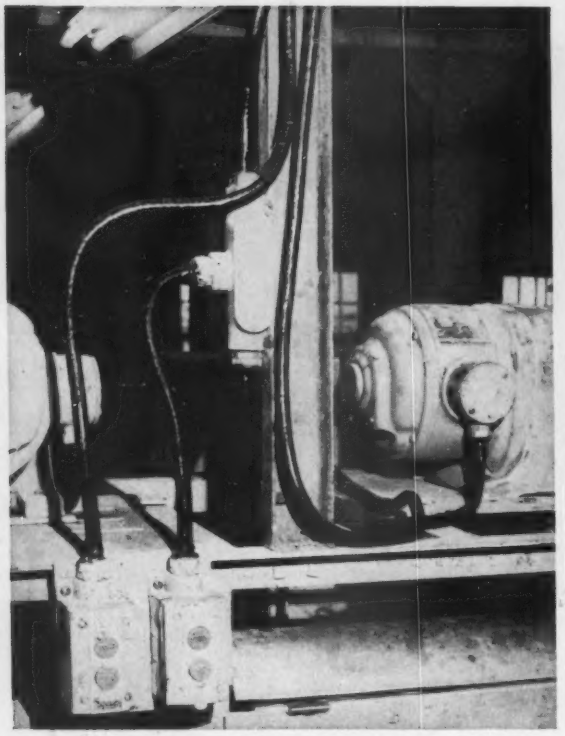
S&C

Specialists in High-Voltage Switchgear for Electric Utilities since 1910

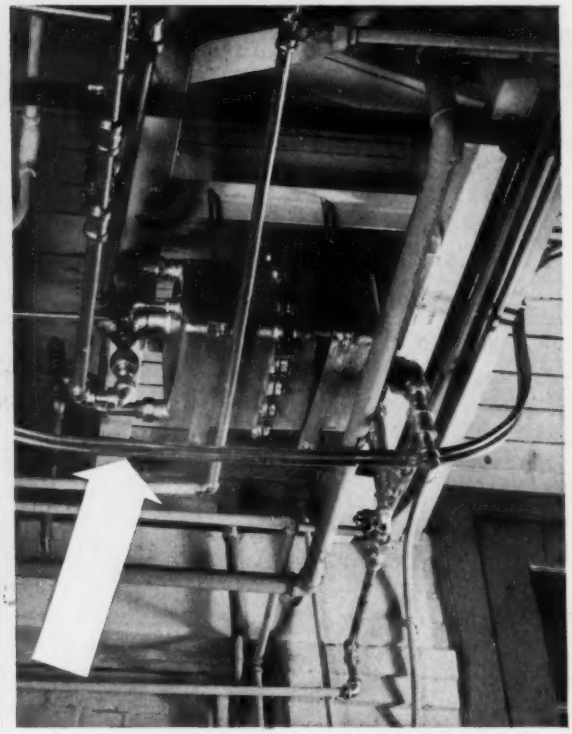
S&C ELECTRIC COMPANY

4425 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U.S.A.

Consult your telephone directory. Sales offices in Birmingham, Boston, Buffalo, Chicago, St. Louis, Cleveland, Dallas, Dearborn, Denver, Houston, Huntington, Indianapolis, Jersey City, Kansas City, Little Rock, Memphis, Minneapolis, New Orleans, Philadelphia, Pittsburgh, Portland (Ore.), St. Petersburg, Salt Lake City, San Francisco, San Gabriel (Los Angeles), Seattle, Syracuse, Washington, D. C. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.



Simple terminations—aluminum-sheathed cables are as simply terminated as conventional rubber-insulated control cables. For leads to motors and control apparatus, an aluminum sheath also provides a neat, space-saving installation. This photo shows optional Okosheath Protective Covering applied over aluminum sheath to combat an extremely corrosive atmosphere in this installation.



Easy installation—aluminum-sheathed cable is inherently rigid, yet see how easily it can be installed around pipes, heat exchangers, and other obstructions. Conduit is eliminated. Regular conduit clamps give all the support necessary for overhead installations. Note that aluminum sheath is seamless, providing a permanent moisture-proof barrier.

new aluminum-sheathed cables eliminate conduit

Many advantages are obtained from the addition of a *seamless* aluminum sheath over standard cable constructions. Virtually any Okonite cable —including rubber, plastic, varnished cambric and paper-insulated constructions—can now be obtained with an Okonite aluminum sheath.

A list of the advantages resulting from this new technique is in the next column. For further information, write to The Okonite Company, Passaic, N. J.

- **no conduit—cuts installation time and costs**
- **eliminates pulling problems and possibility of damage to conductors**
- **high tensile strength and rigidity, yet easily bent with standard tools**
- **impervious barrier to liquids and vapors**
- **mechanically strong**
- **excellent flame resistance**
- **simple terminations**
- **small diameter, light weight**

3502

OKONITE SINCE 1878 *insulated cables*

For complete protection... against explosion, dust, rain... sell

APPLETON

INDUSTRY'S MOST ADVANCED LINE

Circuit Breaker, Motor Starter and Combination Motor Starter

UNILETS®

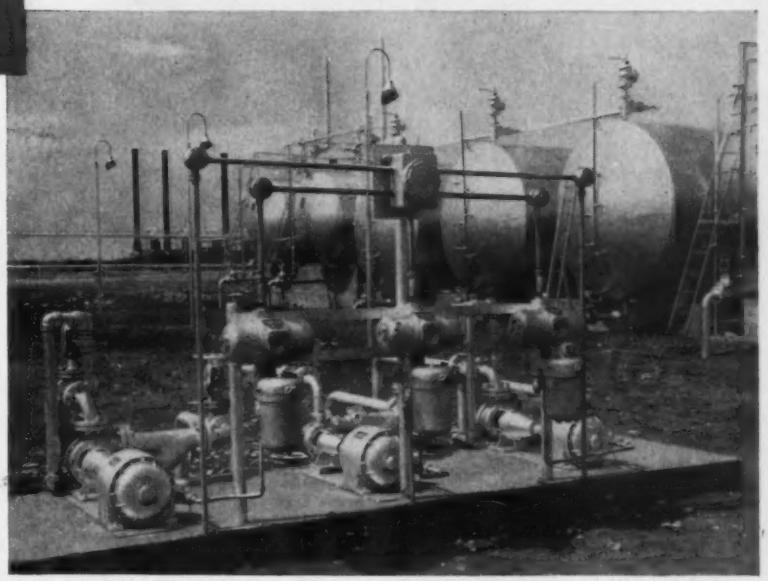


Photo courtesy Oil & Gas Journal

APPLETON Circuit Breaker and Motor Starter Unilets on tank car loading pump motors in field processing plant.

More TOP-QUALITY features!

- First to be U.L. Approved for banked circuit breaker grouping
- Combinations meet U.L. requirements through approval of components
- No shut-downs while entering motor starter of a combination
- Full 7-thread Explosion-Proof protection
- Unmatched accessibility
- Compact, lightweight construction
- Units may be added quickly, easily
- Flexible field set-ups with single and duplex male and female hub adapters

Also Manufacturers of:

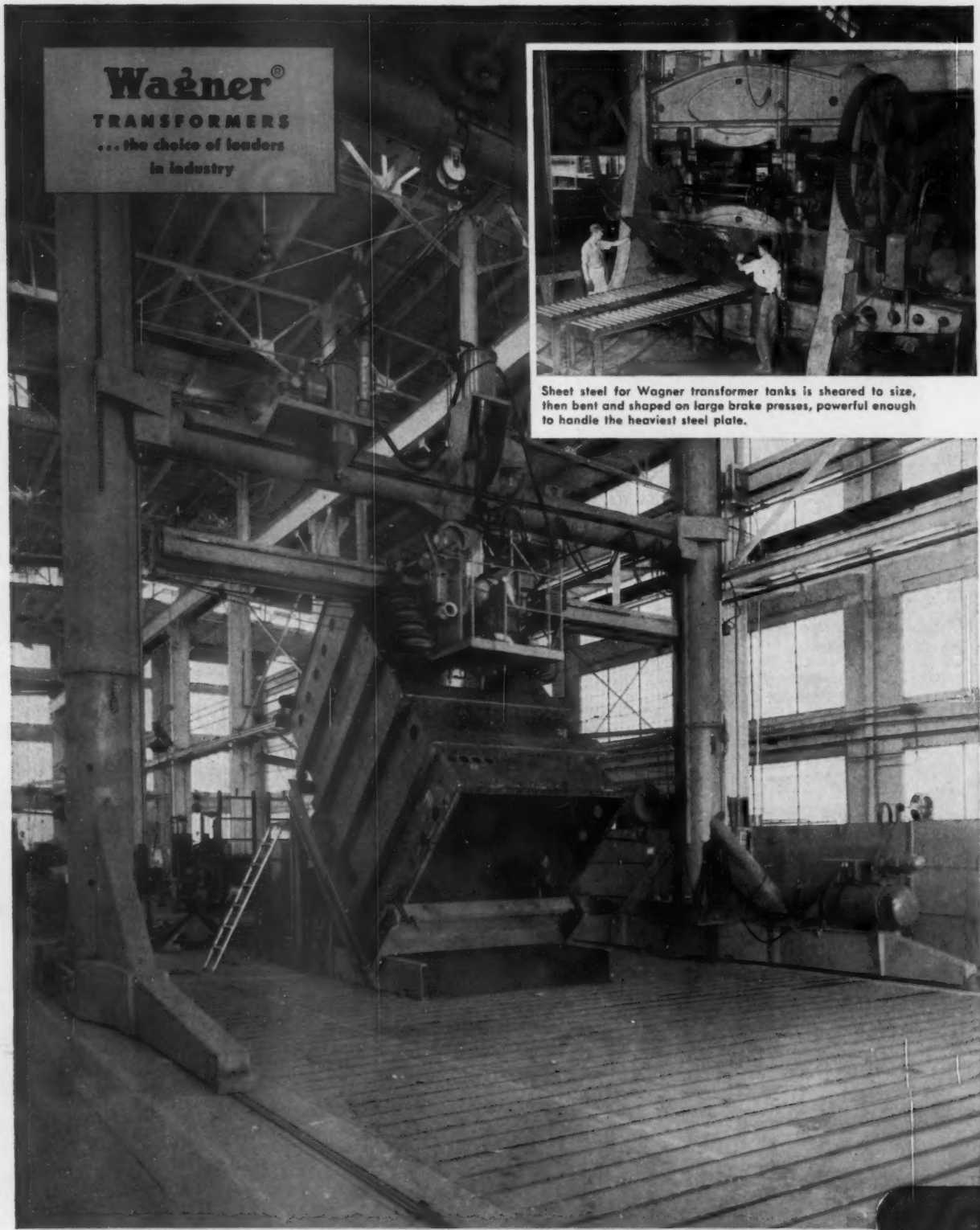
The biggest advancement in Explosion-Proof design in years! The design, construction and performance of APPLETON Circuit Breaker and Motor Starter Unilets give your customers safety and unparalleled ease of wiring, installation and maintenance. They'll discover initial and long term savings plus many exclusive APPLETON features, not found in any other enclosure.

Where absolute safety is required, regardless of the installation, APPLETON can serve your customers better! Send for Bulletin BH today for complete information!

Sold Exclusively Through Selected Wholesalers

APPLETON ELECTRIC COMPANY
1709 Wellington Avenue • Chicago 13, Illinois

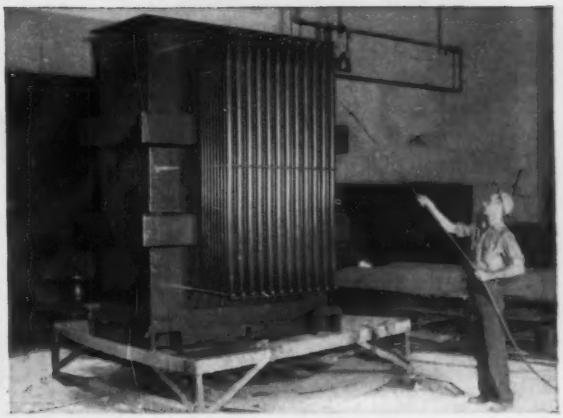
Rely on **APPLETON** *... the Standard for Better Wiring*



Sheet steel for Wagner transformer tanks is sheared to size, then bent and shaped on large brake presses, powerful enough to handle the heaviest steel plate.

This giant submerged arc automatic welding gantry designed and built under the direction of Wagner's engineers assures strong, uniform, leak-proof welds for longer-lasting transformers. It is capable of welding transformer tanks 20 feet long, 20 feet wide and 16 feet high. Controlled from one central station by a single operator, it can make smooth, continuous welds 17 feet long.

The worker in the "Man-from-Mars" costume is a sandblaster. After welding, the completed tank is carefully tested for leaks and then sandblasted to remove all rust, dirt and scale.



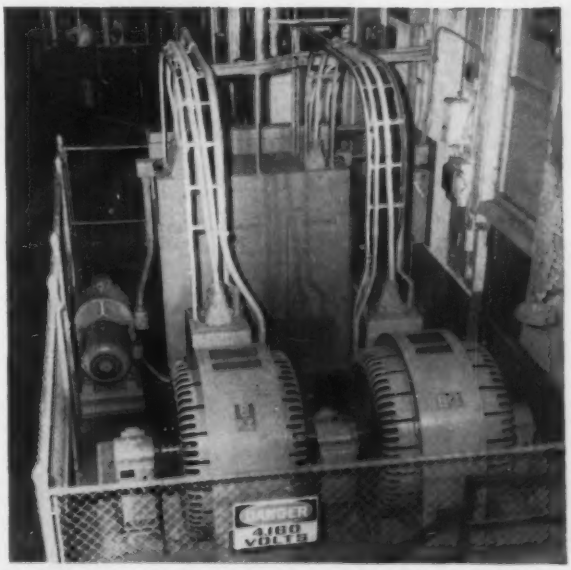
All tanks receive three coats of special paint applied by the flow painting process for long-lasting protection on all surfaces. Each coat is thoroughly dried and hardened in a baking oven.

Here's why the Wagner power transformers you buy give longer service life

Come inside Wagner's transformer plants. Here you'll find the most modern transformer production facilities manned by skilled technicians and all of it backed by Wagner's better-than-sixty-years of transformer building experience...

Wagner's insistence on the use of only the highest quality materials — carefully controlled production methods — rigid inspections and tests — all combine to assure you of power transformers that will provide the utmost in reliability and service continuity.

It will pay you to consult Wagner on your next power transformer installation. The Wagner Electric Corporation maintains thirty-two branch offices, located in principal cities, for quick convenient engineering service and consultation.



A 300 cycle generator for performing NEMA Standard induced voltage tests of turn-to-turn and major insulation. This is one of many tests made to insure that Wagner transformers meet all standards.

Wagner Electric Corporation EST. WE 1891

WAGNER ELECTRIC CORPORATION
6381 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

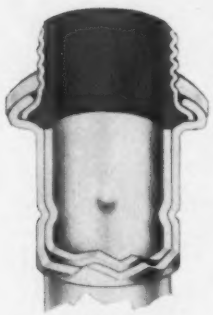
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

T56-2

B-M INDENTER TYPE FITTINGS FOR E.M.T. Concrete-tight

Red Throat
Insulated Connector



Red Throat
Cross section

Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job.

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

B-M COMPRESSION TYPE FITTINGS FOR E.M.T. Rain-tight

SIZES FROM ½" to 2"

SIZES FROM ½" to 2"

SIZES ½" ¾" 1"

SIZES ½" ¾" 1" 1¼"

SIZE ½"

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS

LETTERS TO THE EDITOR

More Data on Cathodic

To the Editor:

May we refer to your article titled "Electricity Protects Idle Merchant Fleet" on p 77 of the December 1955 issue of ELECTRICAL WEST. The story pertains to the U. S. Maritime Administration's Olympic reserve fleet.

The basic design of the cathodic protection system was done under the direction of A. C. Himmler, technical adviser to the chief, division of ship custody, Maritime Administration, U. S. Department of Commerce, Washington, D. C. This design included number, type and location of carbon anodes, rheostats and rectifiers, and the power and voltage requirements. The Maritime Administration obtained much of this data from experience on similar installations made elsewhere.

The Corps of Engineers, U. S. Army, prepared contract plans and specifications from the basic design data furnished by the Maritime Administration. The corps also administered the construction contract for the installation of the system.

One unusual feature of the installation is the power substation built by the Corps of Engineers. The 7,200/12,470-480-v, three-phase, 300-kva transformer bank and switchgear are enclosed in a steel building placed on piles on the beach. Primary service into the building is by high-voltage cable from a metering point located on top of the bluff. The transformers were furnished by Puget Sound Power & Light Co. and installed under the jurisdiction of the Corps of Engineers.

GILBERT R. BEAN
Chief, Technical Liaison Branch
Corps of Engineers
Seattle

Asks for Reprints

To the Editor:

We have received the three copies of the first three sections on "Grounding—Center of Confusion" forwarded at our request . . .

Your magazine, ELECTRICAL WEST, is read through the commission and rather than remove articles of interest before the magazine has been fully circulated we prefer to request copies of the articles of particular interest. We appreciate your kindness in this regard.

R. G. KELLOW
Manitoba Power Commission
Winnipeg, Manitoba

Overselling Flood Control

To the Editor:

Since this last little flood, many wild and unsound flood control plans are being brought out, to get government money.

Aren't we overselling flood control, letting people and promoters build homes and other buildings in low places, subject to floods, because they think that dams and reservoirs will stop all floods?

Did you ever notice that many of the old houses in Sacramento and Stockton were built up about 6 ft off the ground because, back in those years of 31 in. of rain, during that wet cycle, the town was covered with several feet of water. Real old-timers tell me that several years ago you could take a boat and row from Modesto to Stockton by going around a few high spots. Some of these days it will repeat, if the engineers don't wake up, stop overselling flood control, give it its just due, yes, but don't overrate it.

Rivers must be straightened out, kept clean. They must carry off the water in years like this one and the real bad ones to come.

FRANK ANDREWS
Consulting Engineer
Modesto, Calif.

A Mild Boom

To the Editor:

Your editorial in the February issue of ELECTRICAL WEST on the subject "Hear a Dull Thud?" has just come to my attention.

The National Electrical Week Committee recognized the hazard of the type of reaction indicated in your editorial when we decided to go ahead and initiate the observance of National Electrical Week in 1956. It was not until almost mid-December of 1955 before we received official endorsement of the project from the sponsor organizations and we had to make the choice at that time as to whether we should go ahead in 1956 without the aid of professional help and dependent solely on volunteer activity and the good grace of the electrical trade press to get our story out to the field. We decided to go ahead and encourage the widest use of local imagination in devising appropriate ways and means of observing National Electrical Week at the local level in the hope that many ideas would be generated, which could then be utilized in our more formal presentation of the idea for 1957.

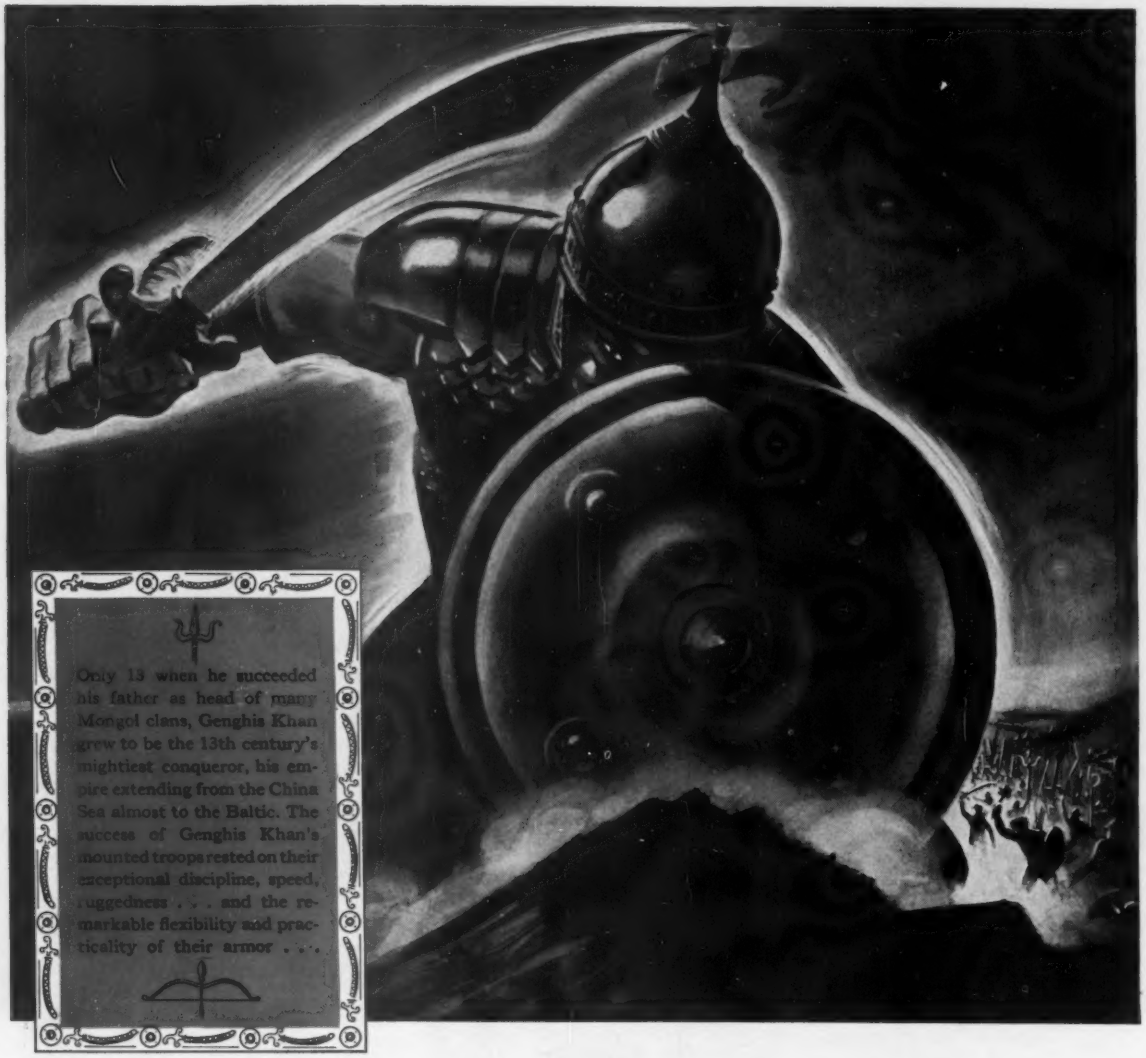
You may have heard a "dull thud" out on the Pacific Coast but I want to assure you that in many areas very significant and timely activities were organized on very short notice with surprising results . . .

Here and there over the country, significant celebrations were held wherever the local group had access to satisfactory information about the program . . .

. . . while there may have been a dull thud in some areas there was a "mild boom" in many other locations and the committee is well pleased with the results accomplished with such a limited time and wholly on the result of the splendid cooperation of the trade press and of the staff personnel of the sponsoring organizations.

With more time to plan and with the aid of professional assistance in developing a plan book for next year's activity, I am sure we can accomplish the objective you so effectively state in your editorial; namely, "a smack instead of a thud next February."

M. E. SKINNER
Chairman
National Electrical Week Committee
New York City


Only 13 when he succeeded his father as head of many Mongol clans, Genghis Khan grew to be the 13th century's mightiest conqueror, his empire extending from the China Sea almost to the Baltic. The success of Genghis Khan's mounted troops rested on their exceptional discipline, speed, ruggedness . . . and the remarkable flexibility and practicality of their armor . . .

PROTECTED... against constant enemies

Flexibility and *practicality,* important characteristics of armor in Genghis Khan's day, can refer as readily to a modern-day kind of protection—Kerite Cable's never-equalled, never-surpassed insulation. Moreover, Kerite's endurance and resistance to constant attack truly would be a credit to one of those intrepid 13th century Mongol guardsmen.

Kerite Cable has to stand the test of not one enemy, but many—not for days or months, but for 30, 40, 50 and more years. Water, heat, cold, sun, deteriorating elements, time itself—these and more find Kerite an invincible opponent.

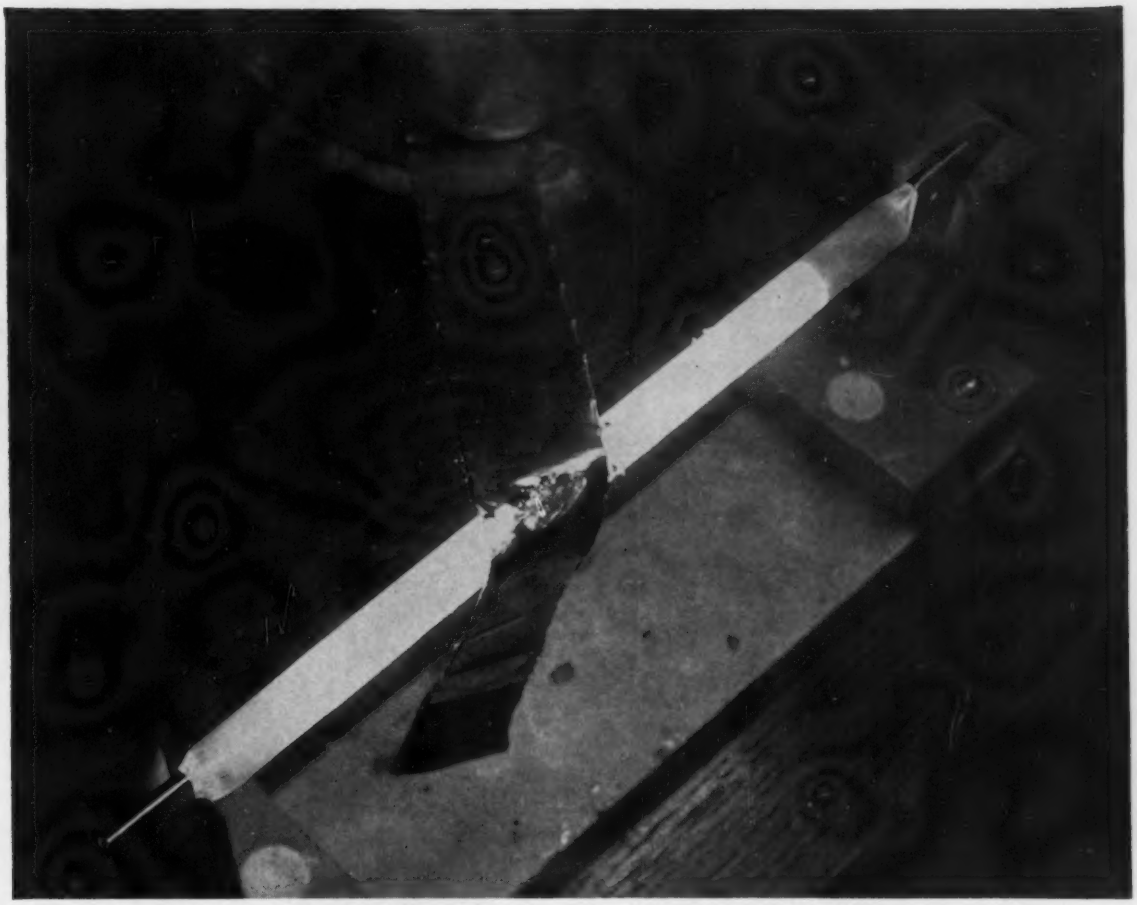
Wherever it is used, the world over, Kerite performs perfectly, lasts almost indefinitely. That is the reason wise buyers specify it.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

Founded 1854



Shown here melting aluminum, the G-E Quartz infra-red lamp can provide heat concentrations up to 1000 watts per square inch.

SMALLEST, HOTTEST, FASTEST electrical heat source available . . . the new General Electric Quartz infra-red lamp

Here's a lamp you can recommend where a powerful compact heat source is required

Heat concentrations 20 times that delivered by previous infra-red sources are possible with the new G-E Quartz infra-red lamp. Hot enough to melt aluminum! So rugged it won't crack under ice water when it's red hot! Entirely new uses are foreseen for this extremely powerful and compact energy source. Bulky equipment can be reduced in size. Here are but a few of many applications in a wide variety of fields where the new G-E Quartz infra-red is already being used:

INDUSTRY—Because of the lamp's extremely fast warm-up, and its compactness, it is being used by manufacturers to heat gears and other metal parts for shrink fitting. In textile mills it is used to speed drying operations, thus contributing to increased productivity.

CAFETERIAS—Where food has to be heated rapidly for large groups—such as in plant cafeterias—the G-E Quartz infra-red can clear bottle-necks by speeding service.

LABORATORIES—Several major aircraft laboratories are using the G-E Quartz infra-red to simulate the heat produced on aircraft surfaces by supersonic flight.

OFFICES—The high concentration of heat from the G-E Quartz infra-red has been responsible for the development of a more compact duplicating machine that provides sharp reproduction, simply and in a matter of seconds.

For your customers who are looking for a truly powerful source of heat or infra-red energy, you can suggest the General Electric Quartz infra-red with full assurance that you are recommending one of the most reliable and versatile tools available today.

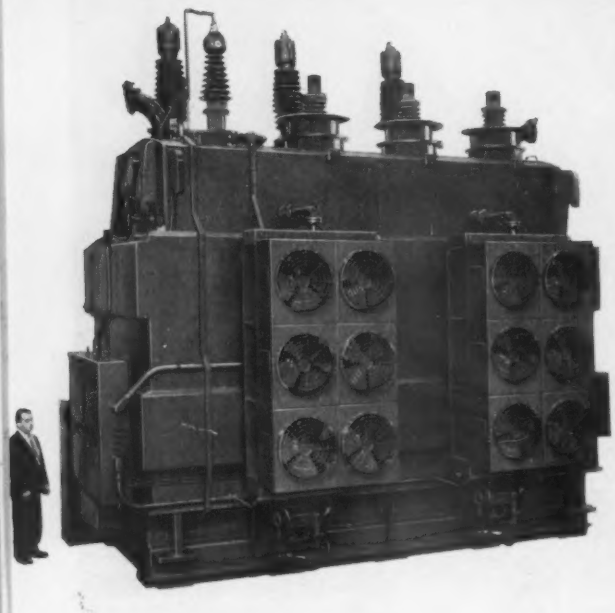
For more information write General Electric Large Lamp Dept. WE-4, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

MAIN STEP-UP
GENERATING STATION

CONTOUR-DESIGN, SHELL-FORM CONSTRUCTION

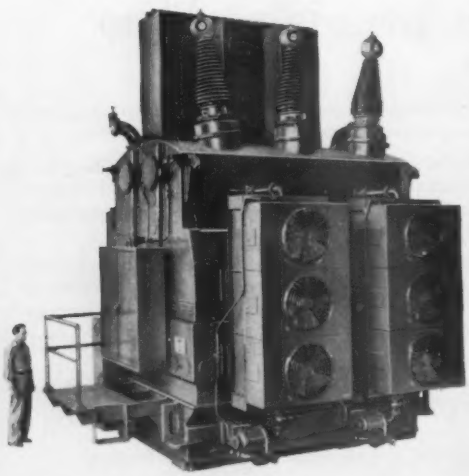


175,000 Kva 3 PHASE

High Voltage: 115,500 Grd. Y volts
Low Voltage: 17,500 Delta volts
Oil-immersed, forced-oil-cooled with forced-air cooler

140,000 Kva 3 PHASE

High Voltage: 115,000 Grd. Y volts
Low Voltage: 14,700 Delta Volts
Oil-immersed, forced-oil-cooled with forced-air-cooler



120,000 Kva 3 PHASE

High Voltage: 145,000 Grd. Y volts
Low Voltage: 19,800 Delta Volts
Oil-immersed, forced-oil-cooled with forced-air cooler

CORE-FORM CONSTRUCTION

56,000/70,000 Kva SINGLE PHASE

High Voltage: 93,000/161,000 Grd. Y volts
Low Voltage: 19,000 volts
Oil-immersed, self-cooled/forced-air-cooled

TRANSFORMERS

BY

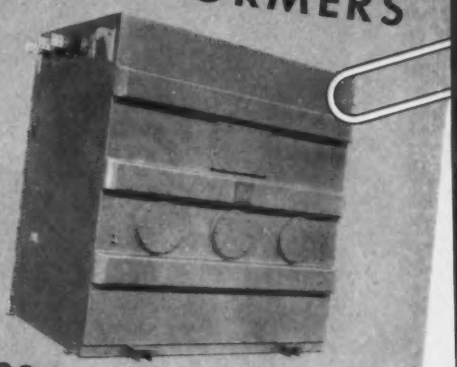
PENNSYLVANIA

. . . pioneer of 1-piece shipment of large power transformers

The three main step-up transformers pictured at the left are "giants" from the standpoint of kva capacity — ranging from 120,000 kva to 175,000 kva. In physical size, however, their dimensions and weights were kept well within the limits for *one-piece shipment.* This was possible because of the extreme compactness of Pennsylvania's own "contour design" shell-form construction.

The units traveled to their respective installation sites in an upright position, with only bushings, cooling equipment and certain accessories removed. This meant easier handling in the field, with greatly reduced installation time and costs.

Station Auxiliary TRANSFORMERS



2,000 Kva SILICONE-INSULATED DRY-TYPE TRANSFORMER

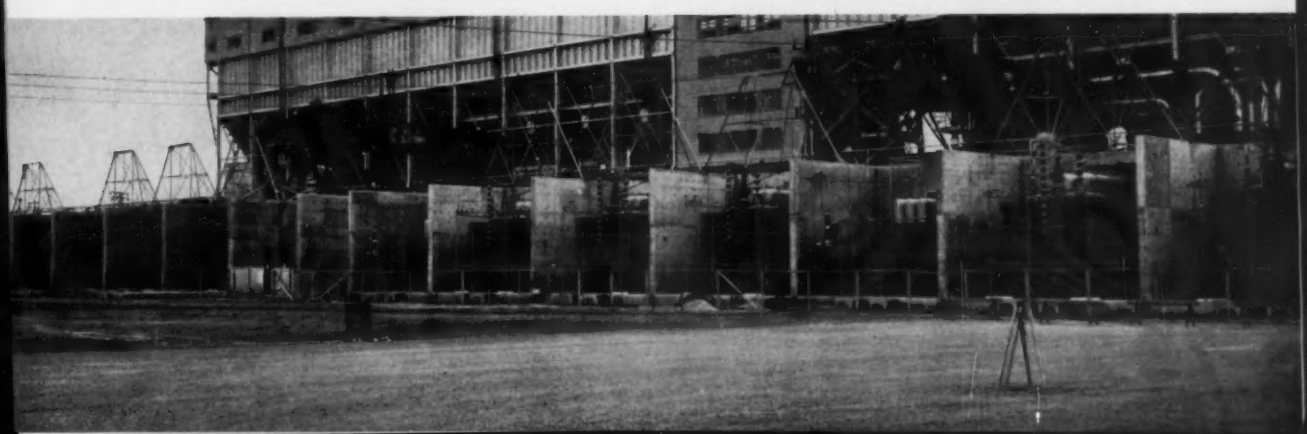
Just as Pennsylvania led the way in one-piece shipment of large power transformers, the company also pioneered the development of silicone-insulated units —the fire- and explosion-resistant transformers that are safest of all for both indoor and outdoor installations.

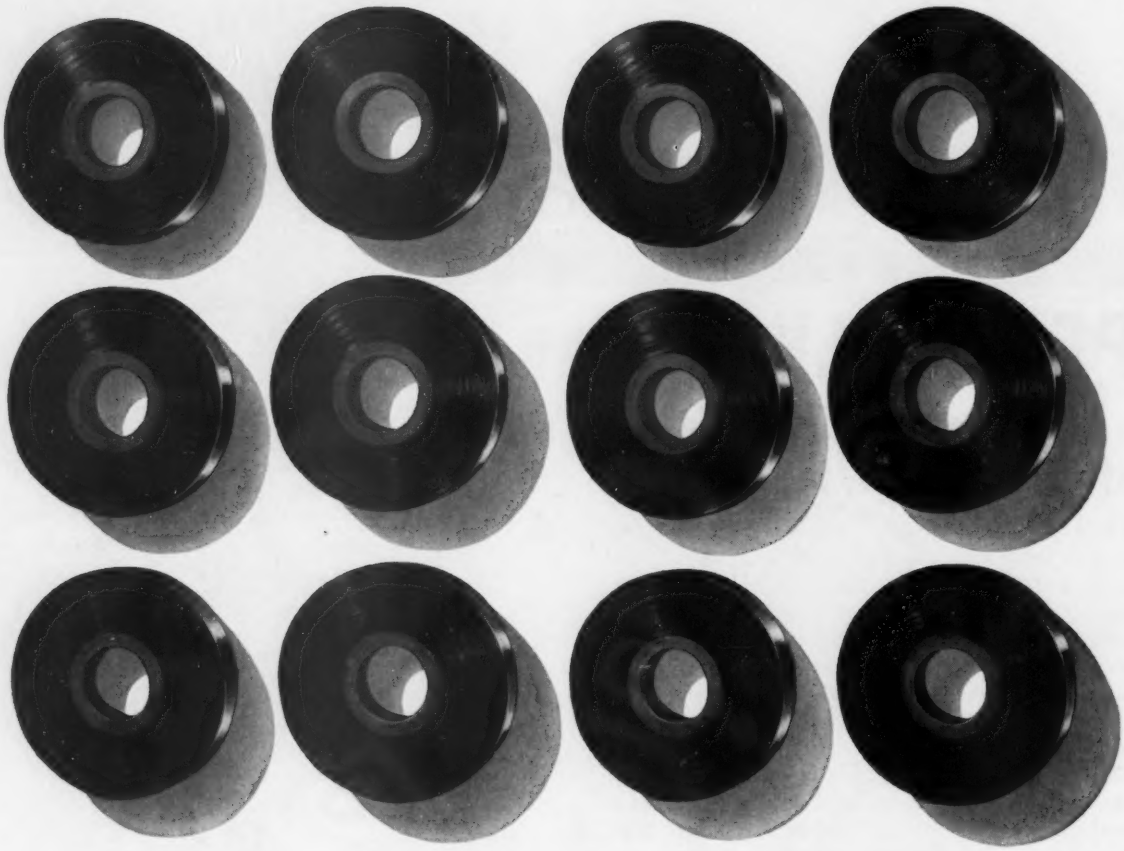
The 2000 kva station auxiliary unit pictured is believed to be the largest silicone-insulated (formerly "Class H") transformer ever built. It is a group 3, sealed-in nitrogen, dry-type unit; three phase, 60 cycles, 150°C. temperature rise; 2400Δ—480Δ volts.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** Greater Pittsburgh District

As the *pioneer* of one-piece shipment of large power transformers, Pennsylvania has long been offering this time-saving, cost-cutting advantage with *core-form* transformers as well as with contour-design (shell-form) units. For example, the nineteen 56,000/70,000 kva main step-up generating station transformers pictured here were shipped to their destination in an upright position, completely assembled except for bushings and detachable radiators.





Can you spot a bad roll?

You'd need a pretty sharp eye. Slight variations in tape caliper or in dielectric strength are, like hundreds of other tape properties, pretty hard to see, or to feel.

Yet these tape properties are important — *vitally* important to safe, well insulated wiring — on bus bars, conduit, fittings.

On "Scotch" 33, we turn the job over to scientists — to machines and super-sensitive instruments. They perform hundreds of rigid quality-control tests. They make certain that the first plastic electrical tape on the market (and its heavy-duty cousins: "Scotch" 21, 22) is still the finest. And they make certain the quality *holds*.

That's why more public utility engineers specify "Scotch" 33 than any other plastic tape. They know their men like it — like the way it handles, the way it performs. They know, too, it's the safest way to get exactly* what they want — every time!

**Specifications for "Scotch" Brand No. 33 Plastic Electrical Tape: caliper — .007 inch; dielectric strength — 9,500 volts; adhesion (ounces per inch width) — 25; elongation at break — 175%; tensile strength (lbs. per inch width) — 25; More detailed information on request.*

PRODUCT OF 3M RESEARCH

REG. U.S. PAT. OFF

SCOTCH BRAND No. 33 Electrical Tape

The term "Scotch" is a registered trademark of Minnesota Mining & Manufacturing Company, St. Paul 6, Minn. Export Sales Office: 99 Park Avenue, New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

3M COMPANY

Announcing...Garden Lighting by Moe Light

year 'round Plus Business...Plus Profits!

NOW...NATIONALLY ADVERTISED

Inspiration-Lighting for patios, gardens, floral settings

Beautifully designed deluxe lights at popular prices, to make evening outdoor living fun for the entire family. All America is moving out-of-doors for dining, entertaining, relaxed enjoyment. You can now offer one of the finest lines obtainable, backed by the merchandising magic of the Moe Light name—Sturdy rustproof aluminum construction, fully weatherproofed, every light complete with SJO cord and duplex receptable plug set.

Here's how Moe Light's attractive, permanent self-seller displays put you right into this profitable business...

M-4950 GARDEN LIGHTING DISPLAY DEAL (24" x 48" x 54" high)

YOU GET 19 assorted garden fixtures and display stand, plus 2 FREE fixtures and 1 FREE tripod base.

YOUR COST FOR ALL 19 FIXTURES	$112.00
COST OF SELF-SELLER DISPLAY STAND	30.95
TOTAL COST OF DEAL	**$142.95**
RETAIL VALUE OF 19 ASSORTED FIXTURES	$168.00
RETAIL VALUE OF FREE FIXTURES AND TRIPOD	32.80

(Free items offset cost of display stand!!!)

M-4955 FLOWER BOX DISPLAY (2' x 2' x 6")

YOU GET 6 attractive M-4904 "Mushroom" flower box lights, Display Stand, *plus* FREE M-4910, 25' SJO Extension Cord.

YOUR COST FOR ALL 6 FIXTURES	$ 25.55
COST OF SELF-SELLER DISPLAY STAND	5.95
25' SJO EXTENSION CORD	FREE
TOTAL DEALER COST	**$ 31.50**
RETAIL VALUE OF 6 FIXTURES	$ 42.60
RETAIL VALUE OF FREE EXTENSION CORD	6.15

(Free extension cord offsets cost of display stand!!!)

BETTER HOMES & GARDENS and SUNSET—JUNE ISSUES... will carry a full-page, full-color ad on Moe Light GARDEN LIGHTING!

Sunset Better Homes

THOMAS INDUSTRIES INC.

Originators of MOE Light Inspiration-Lighting

Executive Offices—410 S. Third St., Louisville 2, Ky.

In Canada: 1401 The Queensway, Toronto 14, Ontario, Canada

MAIL THIS COUPON TODAY...

THOMAS INDUSTRIES INC.,
MOE LIGHT DIVISION, Dept. EW-4
410 S. Third Street, Louisville 2, Ky.

☐ Please send complete information on Moe Light displays in time for that Spring business rush.

☐ Have a representative call on me.

NAME_____

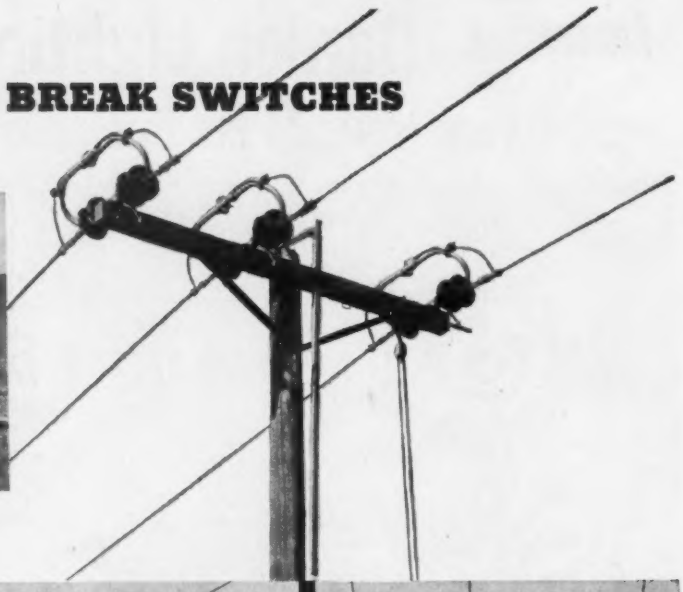
COMPANY NAME_____

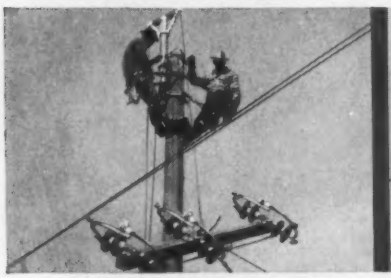
ADDRESS_____

CITY_____ ZONE___ STATE_____

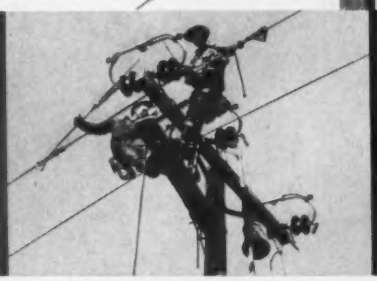
KPF AIR BREAK SWITCHES

1 Sturdy factory-assembled phase units are bolted to cross-arm and push-pull interphase control rods installed on the ground. (Installation is equally simple in the air on installed cross-arms.)

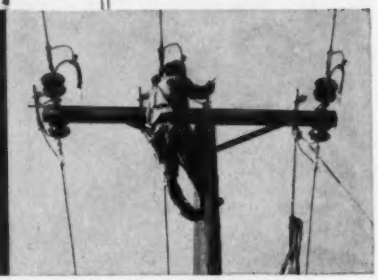




2 At pole top, linemen receive switch bolted to cross-arm and ready to install on pole. Simple design and use of quality materials means KPF phase units are rugged, yet amazingly light weight.



3 Cross-arm bolted to pole, braces and first section of control rod installed. Linemen connect conductors quickly and easily to any standard strain clamp and dead-end direct to phase units.



4 Conductors connected, crank arm being adjusted on push-pull interphase control rod. Like KPF switches and Quick-Breaks, KPF controls need no lubricating. They crack off any icing, are never affected by cross-arm warpage.

Time-tested KPF switches install simply, easily—in 1/2 normal time

KPF switches—the switches that look different because they *are* different—install differently, too. Experience of leading Western power companies shows that KPF switches are normally installed in ½ the time required for complex, cumbersome ordinary equipment. Each KPF phase unit is light weight, readily handled by one man. No extra cross-arms or special supporting structures are needed. Each phase unit is fully assembled, tested and adjusted at the factory. The unit is ready to operate when it reaches the job—no waste of lineman's time. Dependable KPF switches may be mounted horizontally, vertically or triangularly with equal success and long-term, trouble-free service.

For the world's simplest, surest, lowest cost air break switch, specify KPF—standard for nearly 50 years.

KPF
AIR BREAK SWITCHES
Standard for nearly half a century

New catalog gives complete specifications, detail drawings, installation data.

5 Installation complete. Lineman installs operating lever and last section of control rod. Note the neat, clean pole top appearance of KPF switches—a familiar sight throughout the West on such famous systems as PG&E, Southern California Edison and others.

KPF ELECTRIC COMPANY

1624 East Alpine Avenue, Dept. W, Stockton 5, California

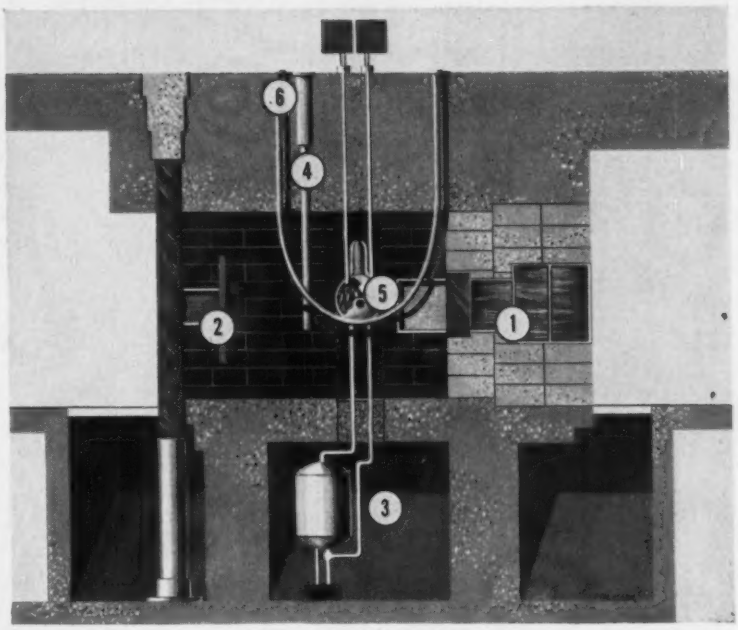
2987

NUCLEAR NEWS FROM ATOMICS INTERNATIONAL

Nuclear Reactor for Cancer and Other Medical Research

This new reactor utilizes the proven homogeneous solution design based on the SUPO unit at Los Alamos—modified and adapted to the special needs of cancer and other medical research and therapy. To be built by ATOMICS INTERNATIONAL for a prominent southern California university Medical Center, the reactor will provide a variety of radiological facilities—primarily high purity neutron and gamma beams with controlled exposure times in each. The thermal neutron flux at the central exposure tube is 1.7×10^{12} n/cm²-sec. at a power of 50 Kw.

Gas handling system assembly for nuclear research reactor. This component, developed by Atomics International, contains facilities for circulating the reactor atmosphere, recombining the radiolytic gases, condensing the water vapor and returning water to the reactor core, in a closed cycle operation. Additionally, the tank at top which contains fission product gases, provides an intense source of neutron-free gamma radiation.



Medical Reactor Test Facilities

1. Gamma and Fast Neutron Facility—Gamma intensities of 1.3 reb/min/Kw and fast neutron intensities of 4 reb/min/Kw are available.
2. Thermal Neutron Facility—Provides neutron flux of 3.8×10^7 n/cm²-sec. per kilowatt.
3. Gamma Radiation Area—Activity of the fission gases provides a radiation source in the gas handling equipment room.
4. Multiple Specimen Irradiation Tube—One or more in the reflector. Each accommodates 16 samples.
5. Central Exposure Tube—A 1-inch internal diameter tube through the center of the core permits access to maximum neutron flux.
6. Pneumatic Tubes—Tangential to core. Also (not shown) are Beam Tubes—Radial to core, or through reflector tangential to the core.

One Configuration of the thermal neutron facility provides a neutron flux of 3.8×10^7 n/cm²-sec/Kw with a gamma ray intensity of only 0.1 reb/min./Kw (reb—roentgen equivalent biological). The fuel is Uranium enriched in the U^{235} isotope in the form of UO_2SO_4 dissolved in light water. This fuel-moderator solution, cooled by chilled recirculated water, is contained in a stainless steel core tank surrounded by a graphite reflector and dense concrete shield. Radiolytic and fission gases produced in operation are handled in a closed-cycle, water recombination and return system, which eliminates any discharge of radioactive core effluents and permits the re-utilization of materials.

Atomics International is a major reactor builder—experienced in the design, construction and operation of nuclear reactors for research and the production of power. If you are interested in any phase of our activities, ATOMICS INTERNATIONAL is staffed and equipped to help you. Please write: Applications Engineering Service, Dept. ET-T1, ATOMICS INTERNATIONAL, P.O. Box 309, Canoga Park, California. Cable address: ATOMICS.

ATOMICS INTERNATIONAL
A DIVISION OF NORTH AMERICAN AVIATION INC.
PIONEERS IN THE CREATIVE USE OF THE ATOM

KEEP YOUR CONDUIT JOBS ON SCHEDULE . . .
WHY YOUNGSTOWN BUCKEYE CONDUIT IS BETTER
Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.
Call your Youngstown distributor

Youngstown

BUCKEYE QUALITY YOUNGSTOWN SERVICE CONDUIT

●You can keep your jobs on schedule, avoid lost time and unnecessary overhead by relying upon your Youngstown Distributor for Youngstown Buckeye rigid steel conduit. You'll get the size and quantity of good steel conduit you want when you want it. Phone your Youngstown Distributor. He'll take care of your order promptly.

THE YOUNGSTOWN SHEET AND TUBE COMPANY Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

the New Importance of the RLM Label II

Look to these leading manufacturers for Industrial Lighting Units with the RLM Label NOW MORE VALUABLE THAN EVER!

With continuous advancements in RLM Specifications, the RLM Label on an industrial lighting unit stands for ever-higher quality standards in lighting equipment performance and construction. Alert, forward-looking manufacturers realize that this makes the RLM Label more valuable than ever to buyers, specifiers and users of industrial lighting equipment. That is why you will recognize the 28 RLM manufacturers above as the leading names in their field . . . companies who will faithfully adhere to the RLM Standard Institute's rigid program of certification . . . firms which gladly submit to the strict RLM testing and inspection program, which assures uniform quality and conformance to standards by periodic inspection on the assembly line and in the field. Today, these manufacturers are especially proud to be able to bring you units bearing the RLM Label, because they know that it is now of even greater value to you than ever before.

Today, the RLM Label stands for higher-than-ever specifications like these:

Incandescent and Fluorescent: New High Reflection Factor. New High Light Output.

Fluorescent: All-White Porcelain Enamel Reflectors. Upward Light for more Brightness Control. Shielding Angles for less Lamp Glare.

For a complimentary copy of the 1956 RLM Specifications Book, write: RLM Standards Institute, Suite 815, 326 W. Madison St., Chicago 6, Ill.

R-1239RR

RLM STANDARDS INSTITUTE INCORPORATED

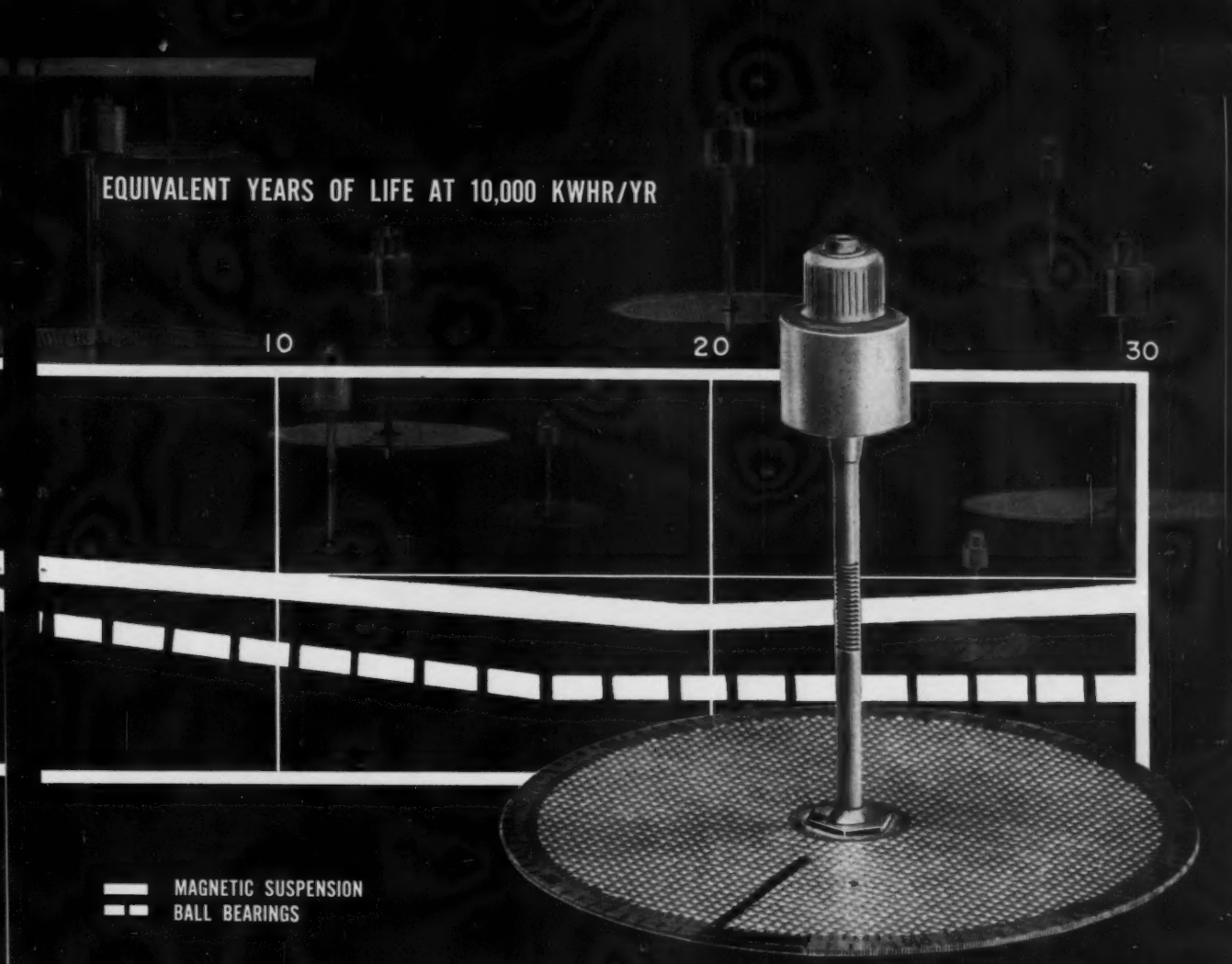
ELECTRICAL TESTING LABORATORIES, INC.

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

Life tests prove . . .

GREATER SUSTAINED ACCURACY

ALL THE COST-SAVING features of General Electric's I-50 meter family have been proven by the more than 6,000,000 I-50's in service today.



G-E MAGNETIC SUSPENSION ASSURES ACCURATE MEASUREMENT OF TOMORROW'S LOADS

New test data on meter performance, compiled in G-E research laboratories, prove that General Electric's revolutionary "floating disc" will accurately measure tomorrow's greater loads. During these accelerated life tests, identical loads were applied to G-E meters with magnetic suspension and to meters using other types of bearing systems to support the moving element.

The test results, based upon a total load of 300,000 kwhr (the equivalent of 30 years' operation at 10,000 kwhr), proved that only General Electric meters with magnetic suspension offer you these important benefits:

Greater sustained accuracy (see chart above)

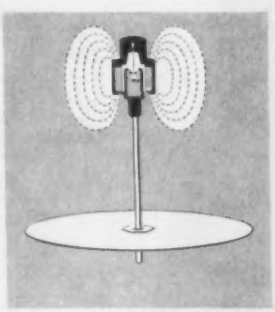
No bearing wear

Greater return on your meter investment

In addition to magnetic suspension, G-E meters provide you many other money-saving features. For example: all meters of the G-E I-50 family offer you a unique one-piece retarding system which assures stability and long life . . . rigid unit construction for maximum strength . . . corrosion-resistant and easier-to-read pointer and cyclometer registers.

For the meter you can install now and depend on for many extra years of accurate service, specify the meter designed for the greater demands of tomorrow's electrical living. Choose meters of the General Electric I-50 meter family.

For more information contact your nearby General Electric Apparatus Sales Office, or write General Electric Company, Section 621-5, Schenectady 5, N. Y.



MAGNETIC SUSPENSION of rotor eliminates conventional bearings, greatly reduces maintenance and replacement costs.

Progress Is Our Most Important Product

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

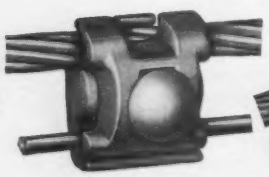
Reduce Inventory!

USE BLACKBURN'S PermaCad Aluminum Fittings

CHECK THESE PLUS FEATURES

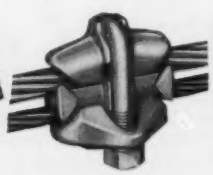
- All fittings may be used on either aluminum or copper conductors. Each fitting accommodates a wide range of wire sizes—few fittings are needed in stock or on trucks.
- Installation errors are eliminated on bi-metallic connections. Either groove will accommodate aluminum or copper conductors.
- Permacad fittings are available in one or two bolt parallel groove clamps—single and double U-bolt clamps. There's a fitting for every job.
- Grooves are contoured to surround conductor and provide large contact areas . . . improving conductivity.
- Non-copper-bearing, heat treated aluminum alloys used in all castings. Hardware available in either hot dipped galvanized steel or high strength aluminum alloy. Bolts alumilited to prevent seizing.

* **PERMACAD** *is a complex, heavy duty plating of cadmium and other metals which has exceptionally long life. PERMACAD protects aluminum because of its favorable electrogalvanic potential and is highly resistant to galvanic corrosion when in contact with copper.*

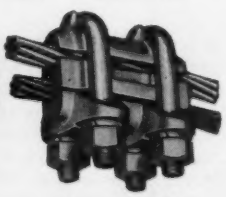


PGP SERIES
One bolt parallel groove clamp. Three fittings accommodate wire ranges from 8 AWG to 397.5 MCM.

PGP 400 SERIES
Two bolt parallel groove clamp. One clamp accommodates conductors from 1 str to 400 MCM.



DLC GP SERIES
Single U-bolt clamp. Four clamps accommodate wire range from 6 AWG to 266.8 MCM.



2U GP SERIES
Double U-bolt clamp. Six clamps accommodate conductors from 1 str to 397.5 MCM.

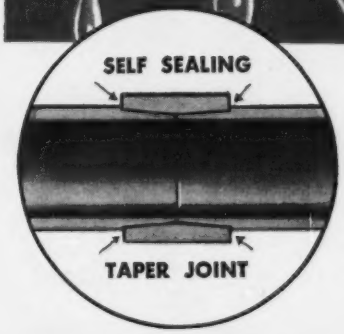
BLACKBURN PermaCad FITTINGS

IMPORTANT: We recommend the use of CONTAX on all aluminum and bi-metallic connections. CONTAX is an oxide inhibiting compound with an ASTM drop point in excess of 500° F.

AVAILABLE THROUGH ELECTRICAL DISTRIBUTORS EVERYWHERE

JASPER BLACKBURN CORPORATION
35 MADISON ST. • ST. LOUIS 6, MO. • PHONE MAIN 1-2821

WATERTIGHT!



Orangeburg Fibre Conduit Prolongs Cable Life

Keep out corrosive ground waters, and you prolong the life of underground cables, say utility engineers!

Why? Because ground waters containing corrosive elements derived from the soil and concrete encasement attack cable sheath and shorten cable life. Orangeburg's impermeable wall and self-sealing Taper-Sleeve Joint shed them *"like water off a duck's back."* You get maximum protection with Orangeburg.

Orangeburg protects cables in many other ways. Smooth bore, low co-efficient of friction reduce incidence of abrasion. Its material is strong, tough, resilient, durable.

No other conduit is easier to install

Light, 8-foot lengths and a complete line of bends and fittings speed installation. Taper-Sleeve Joints tap water-tight in a jiffy. Orangeburg lays faster and at lower cost than any other type of conduit.

Orangeburg Fibre Conduit has prolonged cable life at minimum expense for utilities, municipalities and industry since 1893.

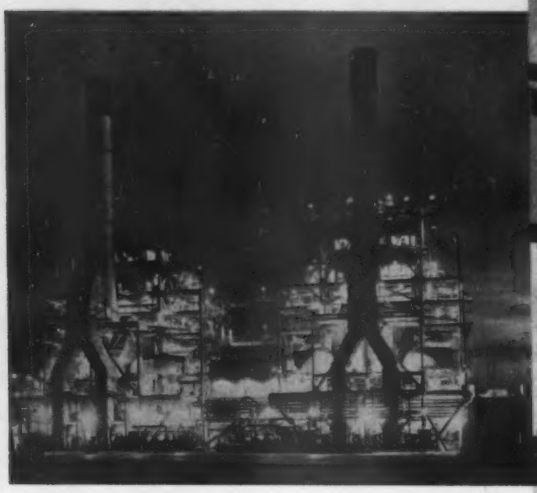
Distributed by Graybar Electric Company and by General Electric Supply Company. Branches and stocks in principal cities.

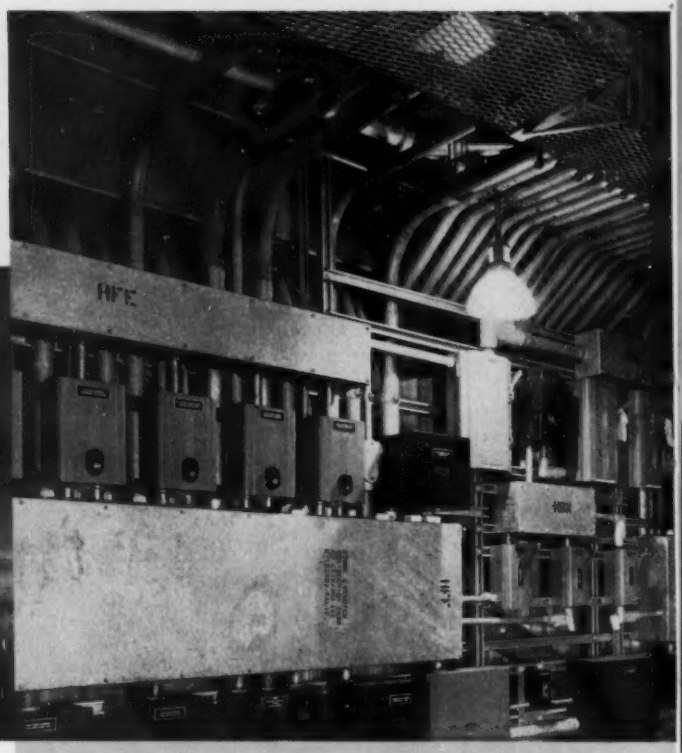
WRITE DEPT. W-46 FOR CAT. 52

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

The ultramodern Etiwanda Steam Station. Capacity 280,000 kw. Open air location of water heaters, steam turbine generators and other equipment speeded building, reduced costs, takes advantage of mild climate.





Many main, branch and feeder circuits at Etiwanda are wired with time-proven dependable RoZone-RoPrene.

ANOTHER MAJOR UTILITY

RoZone-RoPrene for general purpose power circuits...

If you are building a new generating station—expanding present facilities or replacing circuits—Rome Cable has the experience and manufacturing facilities to serve you well.

The Etiwanda Steam Station completed last year by Southern California Edison is a good case in point. To make it the last word in generating efficiency, they considered every component carefully.

For general purpose power circuits, they selected Rome's RoZone-RoPrene.

Long-lived stability

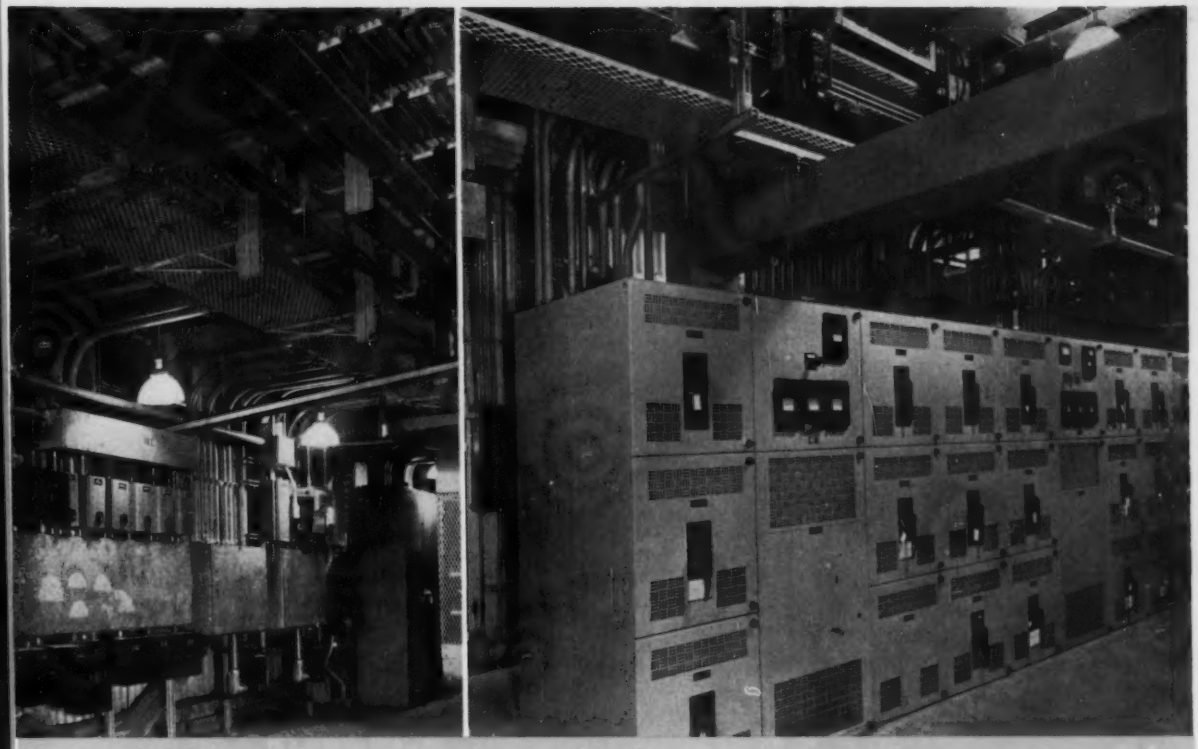
RoZone, a premium quality oil-base compound, has proved its dependability in station after station. It gives you excellent protection against corona and ozone cutting. One of its outstanding properties is unusual resistance to water. This, plus inherent resistance to aging and heat, assures longevity of electrical stability.

Durable protective sheath

RoPrene, a specially compounded Neoprene sheath, provides high resistance to mechanical injury, during and after installation. It resists fire, oils and chemicals. RoPrene possesses superior long-time aging and heat-resistant characteristics. It is lighter and cheaper than lead sheath and immune to corrosion and electrolysis.

The wide acceptance of RoZone-RoPrene by consultants and users, alike, bespeaks its high quality. You can follow their example with confidence.

For conduit they chose Rome • EMT, electrical metallic tubing.



Clean, corrosion-resistant Rome • EMT protects vital power and control cables at Etiwanda Steam Station.

INSTALLATION...

Rome·EMT for cable protection . . .

Easy to install

Rome • EMT combines light weight with speed and ease of installation of compression type fittings. The mirror-smooth inside finish of Rome • EMT makes it easier to "fish" than any other competitive thinwall on the market. Actual tests, involving multiple 90° bends (as many as eight in a single length) have proved this to be true.

High mechanical strength, uniform quality

Rome • EMT is formed from cold rolled carbon steel and electrically welded for maximum strength. Further processing on automatic equipment makes for complete uniformity of quality of its electroplated coating of zinc. The Rome • EMT installed in the Etiwanda Station speaks for itself. It will provide protection for important circuits for many years.

Rome Cable engineers will welcome the opportunity to study your installation problems at any time. Write or phone your nearest Rome Cable office.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

WESTERN SALES OFFICES AND WAREHOUSES

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3430 Fourth Ave., So.

DENVER 3, COLO.
1160 Elati St.

PORTLAND 5, ORE.
1020 S.W. Taylor St.

How're ya going to keep things up on the farm

. . . . . unless there's enough distribution? Today the "average farmer" uses about 700 kw-hr a year for production work; and about three times that much in his home. Informed guessers say that the "average farmer," ten years hence, will be using a little more than ten times as much—perhaps 30,000 kw-hr—each year!

Most of it, quite likely, will be brought in on rural distribution lines IF THEY GROW AS FAST OR FASTER than the predicted use. Otherwise the bright electrical future will be a wistful thought if line capacity doesn't keep pace.

As you look ahead to possible increases on your rural load—the egg washers and wash dryers, the hay dryers and dish washers—remember that Graybar is a willing, competent partner in any line-building program. Graybar will stock what you need, hold it, and deliver at the time and place you choose. Ohio Brass Insulators, and related line hardware, are stocked by Graybar for applications as high as 23 kv.

OHIO BRASS COMPANY • MANSFIELD, OHIO

Ohio Brass

4665-H

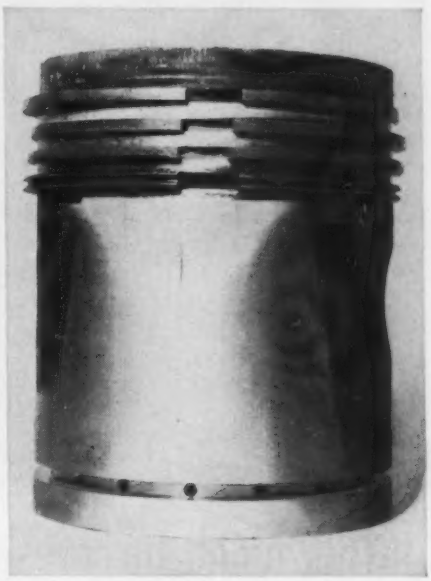
Standard Engineer's Field Report

CASE HISTORY

LUBRICANT *RPM Delo Oils*

FIRM *Del Este Water Company, Modesto, Calif.*

Engine powers pump for 28,000 hours—sleeve wear is less than 0.002 inch!



PUMPING UP TO 2200 GALLONS OF WATER PER MINUTE, a 165 h.p. natural gas fueled Waukesha engine ran 24 hours a day for more than three years in the Del Este Water Company plant at Modesto, California. Driving a turbine pump, it worked against a constant head, with speed controlled to maintain a set pump discharge pressure. In spite of this tough service, RPM DELO Special Lubricating Oil kept engine in perfect operating condition right up to time of inspection. Oil consumption actually was less for the last 8000 hours service than for the first 8000. Inspection showed sleeve wear only 0.001 to 0.0015" with no taper; crankshaft "miked" within factory standards. As shown above, rings and grooves are clean, sleeves unscored. Same sleeves and pistons were reinstalled and engine went back into pumping service.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

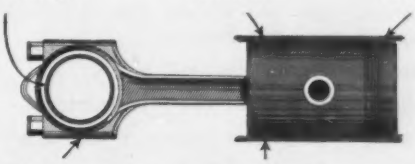
FOR EXPERT HELP on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative, or write to 225 Bush Street, San Francisco, California.

Why RPM DELO Oils prolong engine life

Special compounds stop corrosion

Anti-oxidant resists lacquer formation

Detergent keeps parts clean



Inhibitor resists foaming

Metal-adhesion qualities keep oil on parts in running or idle engines

STANDARD OIL COMPANY OF CALIFORNIA

This could be you—"In the Land of No Distributors."

Got an emergency? Want a switch in a hurry? Or some connectors? How about wire? "In the Land of No Distributors" there are no "over-the-counter" purchases and *hurry* is an unknown word. "In the Land of No Distributors" you couldn't pick up the phone nor could you send Harry or Mike out in the truck to pick up emergency requirements. If the switch or connector or cable manufacturer is in East Hoboken and you happen to be in Chicago you either wait a week or ten days or you make a flying visit to East Hoboken.

Not once, but many a day (and night).

In addition, "In the Land of No Distributors"—

- **You would be pestered by an army of Manufacturers' salesmen.**
- **Deliveries would be chaotic. You would get partial deliveries and wait days for "slow" manufacturers.**
- **You would have to carry a tremendous inventory and insure it.**
- **You would go "telephone crazy" placing hundreds of calls a day to a variety of different suppliers located miles away.**
- **Your "Order Department" and "Accounts Payable" Department would have to be increased a hundred fold.**

That's why dependable electrical manufacturers advise you to always buy from

YOUR DISTRIBUTOR—THE BEST FRIEND YOUR BUSINESS CAN HAVE! He's the *one* source for *everything* electrical—and he's local.

It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE ®

TRIANGLE CONDUIT & CABLE CO., INC.

New Brunswick, N. J.

Manufacturers of Arteries for Electricity, Liquids and Gases.

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE •

OVERWHELMING FIRST CHOICE FOR 50 YEARS

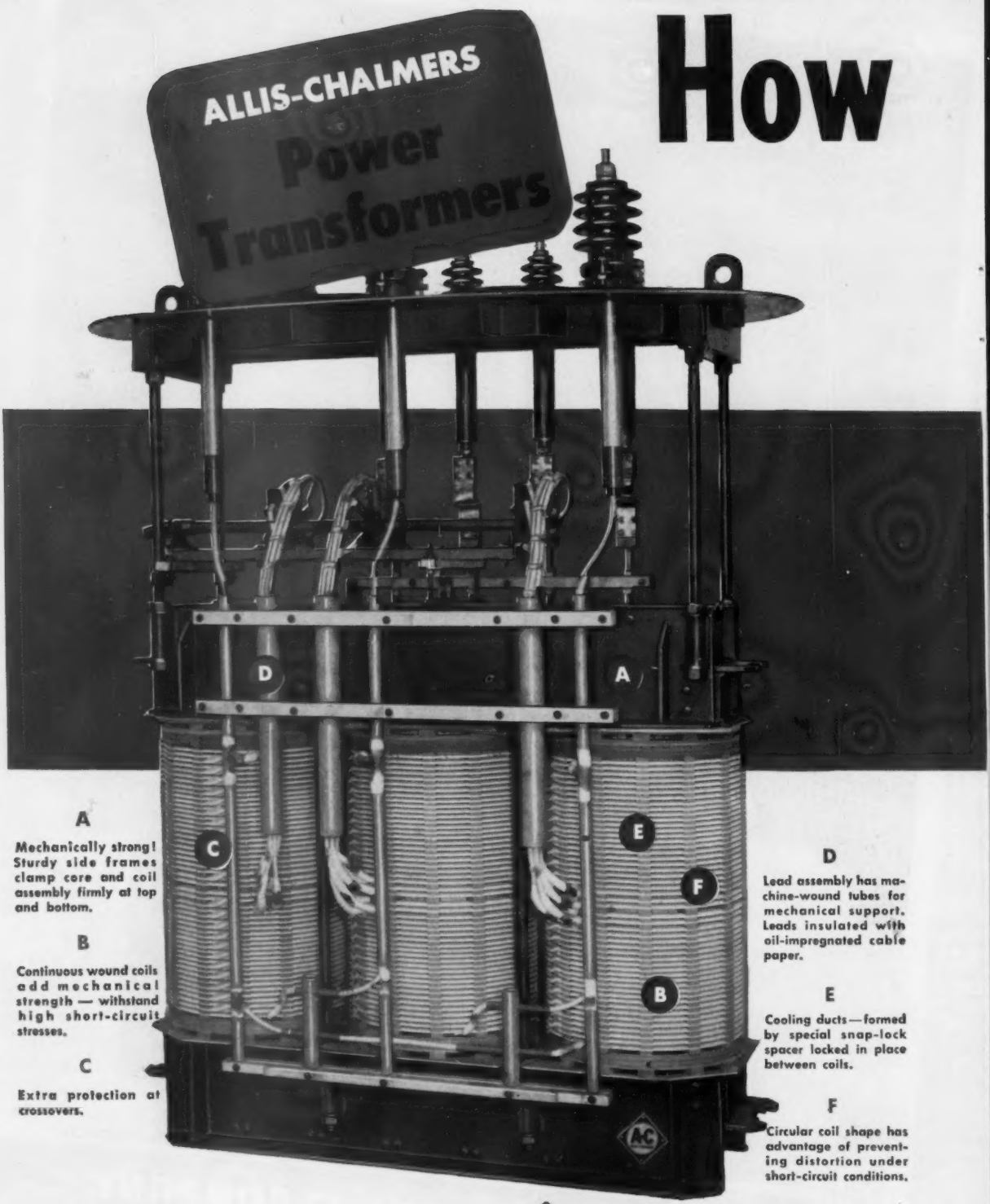
Compare SQUARE D SAFETY SWITCHES...
line for line and feature for feature

THEY COST NO MORE...WHY SETTLE FOR LESS?

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

How



A

Mechanically strong! Sturdy side frames clamp core and coil assembly firmly at top and bottom.

B

Continuous wound coils add mechanical strength — withstand high short-circuit stresses.

C

Extra protection at crossovers.

D

Lead assembly has machine-wound tubes for mechanical support. Leads insulated with oil-impregnated cable paper.

E

Cooling ducts—formed by special snap-lock spacer locked in place between coils.

F

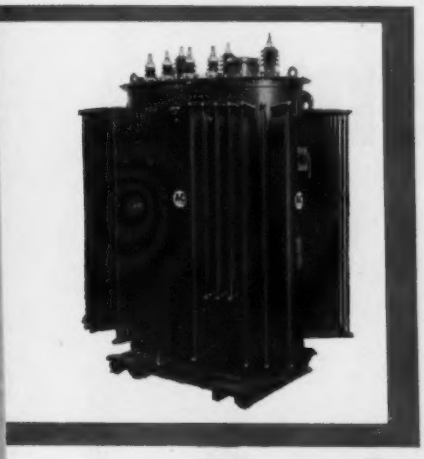
Circular coil shape has advantage of preventing distortion under short-circuit conditions.

A-C ALLIS-CHALMERS

ALLIS-

Balanced Design Works for You

Here's a combination of design features that adds up to *balanced design*... long transformer life



No single feature is all-important in transformers! But together they mean *balanced design* — all the things you want and need in a transformer.

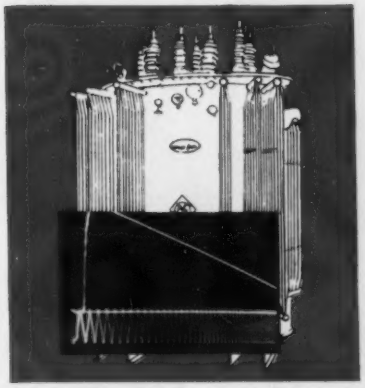
- **High impulse strength**
- **Corona-free construction**
- **Quiet operation**
- **Reduced size and weight**
- **Dependable performance**
- **High short-circuit strength**
- **Rugged mechanical construction**

In balanced design, every feature must contribute its full share to the operation. No feature can outweigh another — each must complement the other.

For example — of what value is "light weight" if it cuts performance? With balanced design you get both light weight *and* efficient performance.

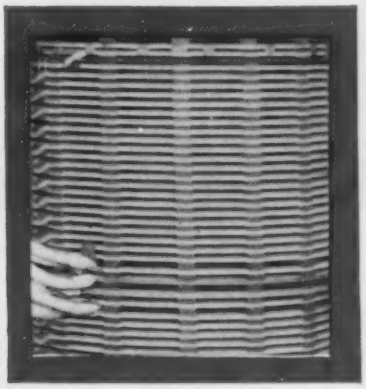
Get complete information. Call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Three features of balanced design



1. Corona-free design. Repeated lightning and switching voltage surges may be applied to the transformer without damage, up to full values as defined by standards.

2. Reduced size and weight. This means higher rated transformers are easier to handle — can be moved without removing radiators and bushings.



3. Proper coil design plus static shields and interleaved coils where needed provides high series capacitance, as well as more uniform voltage distribution.

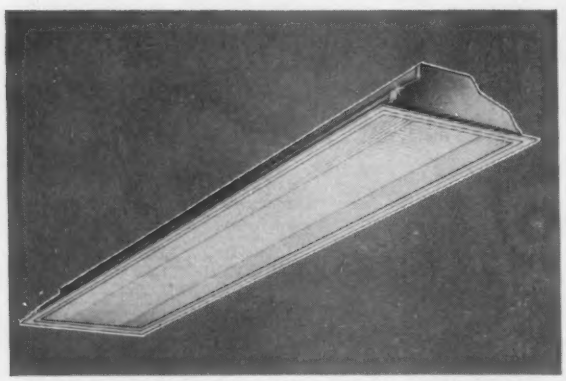
CHALMERS A-4955

Lighting by DAY-BRITE Lighting Fixtures makes the big difference...

Announcing a new line of integrated recessed

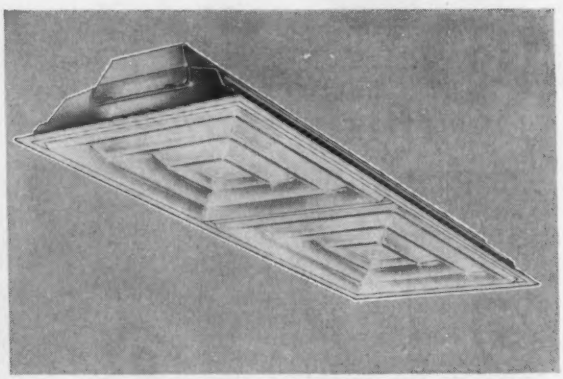
lighting compatible with all 63 ceiling systems

including—acoustical ceilings using exposed runner, exposed panel, exposed grid, concealed mechanical, metal "Tee-Bar" suspension... also conventional plaster ceilings.



New, shallower 12-in. wide Troffers, available with plastic Clear-tex, egg-crate louver or low-brightness Controlens* enclosures.

*®Holophane Co., Inc.



24-in. wide MOBILEX®, available with translucent plastic, egg-crate louver or glass enclosures.

Get details of new economies

Your Day-Brite representative has full details of the economies of Day-Brite's new line of integrated recessed lighting. Call him—you'll find this information valuable.

Certified Lighting for a Better America

"DECIDEDLY BETTER" DAY-BRITE Lighting Fixtures

61136

Day-Brite Lighting, Inc.
5412 Bulwer Ave.
St. Louis 7, Missouri

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

Want smaller, lighter transformers and oil circuit breakers?

Then **LOCKE'S TYPE U** is the bushing for your apparatus!

Type U is the high voltage apparatus bushing which gives you all the desirable electrical characteristics of earlier bushing designs PLUS the added advantages of smaller dimensions and lighter weight.

For example, Locke's 161 KV Type U bushing is 6¼" *smaller* in ground sleeve diameter, and 590 lbs. *lighter* than its equivalent of earlier design. There is no sacrifice in dielectric strength.

Specify Type U for your apparatus, and chances are good you'll find that your transformers and oil circuit breakers will come to you accordingly smaller and lighter.

For replacement purposes, Type U is ideal because you can handle it more easily during installation . . . and less storage space is required.

Consult your apparatus manufacturer, or send today for complete descriptive literature.

Unusual Radio Noise Test Procedure . . .

Photo shows radio noise test of 287.5 KV Type U bushing. (Today, radio noise is almost zero.) *Each* and *every* Type U bushing is radio noise tested both *before* and *after* one minute ASA standard high potential dry withstand test. This procedure is unusual as the common industry practice is to test on a selected sample basis. Locke makes this and other extra tests to insure uniform bushing reliability.

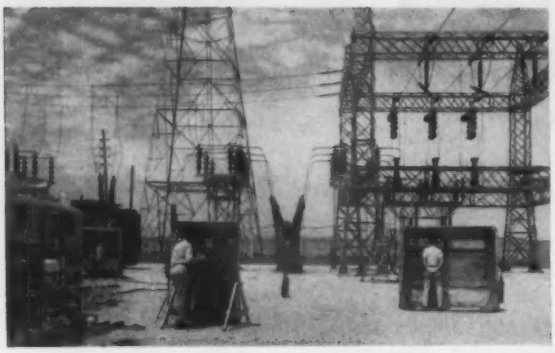
FOR 92 KV AND ABOVE

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

PRODUCT NEWS

New Designs and Applications

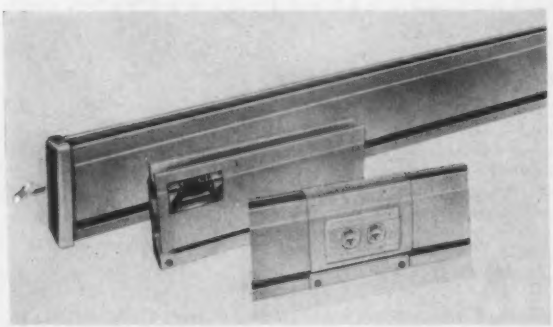


(1) A. B. Chance Co., Centralia, Mo., tests new cutout designs with a mobile laboratory. Pictured here is the test equipment at a substation of Kansas City Power & Light Co. at work on a new open-type drop-out cutout. Slow-motion movies are made of tests

Heavy-Duty Dollies

(2) Acorn Co., 1482 S. Milwaukee St., Denver 10, Colo.

This new moving dolly withstands weights up to 90 tons, the manufacturer reports, and does away with the use of skids, pipes, winches and cables in handling of large stationary equipment. This is said to be an important safety feature. They consist of two 4-in. roller-bearing, cast iron wheels enclosed in a heavy hardened steel frame. Sold in sets of four.



Baseboard Heaters

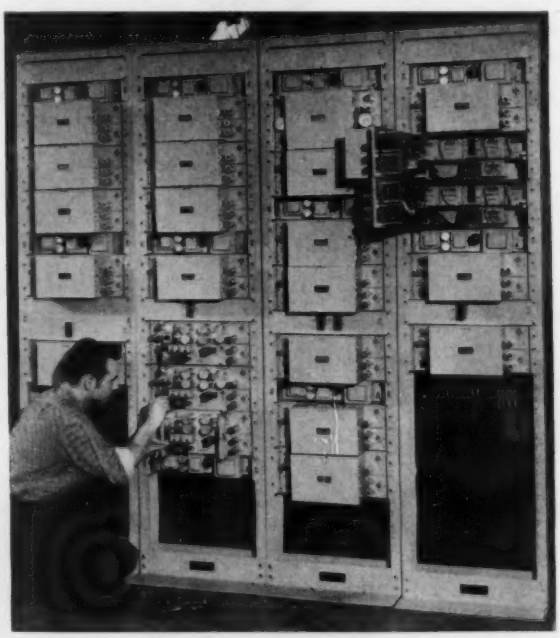
(3) Cavalier Corp., 343 W. First St., Chattanooga, Tenn.

New features of this electric space heating equipment offer savings in wiring costs plus built-in conveniences. One section carries the thermostat, which eliminates separate installation of controls, and another has a standard 110-v convenience outlet that fits into the baseboard installation anywhere it is wanted. The complete heating system can be installed without cutting into a single wall.

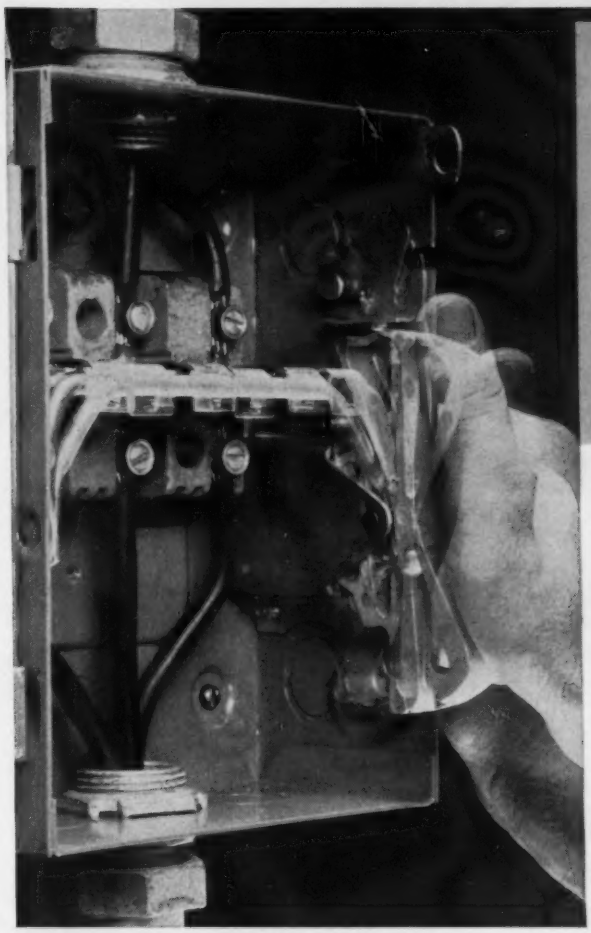
Cab-Over-Engine Trucks

(4) Four Wheel Drive Auto Co., Clintonville, Wis.

A new line of cab-over-engine trucks featuring four-wheel drive and ranging from 14,500- to 40,000-lb gross vehicle weight has been announced by this manufacturer. Designed for utility line construction and maintenance, the trucks are available in all 4x4 weight classifications and may be obtained for special six-wheel-drive applications. Horsepower range is 131 to 240 and transmission speeds vary from 4 to 10.



(5) Canada's longest private commercial microwave communications system will have this Stromberg-Carlson multiplexing equipment. It is being built for the Quebec Hydroelectric Commission by RCA Victor Co. of Montreal. This equipment "scrambles" messages—sends them on one channel—then unscrambles them



The positive arc-restricting switching action of BullDog's Clampmatic Vacu-Break Safety Switches is shown in the above demonstration photo of the switch interior. In all normal operation, the switch box door is closed.

MASTER CLAMPMATIC VACU-BREAK, unequaled quality and high performance. Acts as disconnect or service entrance switch. Fills applications up to 1200 amps.

JUNIOR CLAMPMATIC VACU-BREAK, deluxe general-purpose switch at an exceptionally low price. The complete line ranges in ratings from 30 amps to 600 amps.

Switch with Security!

GET BULLDOG CLAMPMATIC VACU-BREAK SAFETY SWITCHES

Greater safety . . . longer life . . . no costly maintenance!

BullDog Safety Switches bring you real extras — in safety, in performance, in longer life. The two types shown — Master and Junior — cover a wide range of applications, meeting your needs with greater efficiency.

They feature these *Big 3* BullDog exclusives: (1) Vacu-Break® arc control, (2) Clampmatic® action, and (3) dependable switch mechanism.

The Vacu-Break control smothers arcs, minimizes pitting and burning. The Clampmatic action provides bolt-tight contact pressure. The BullDog switch mechanism *guarantees* positive switching security.

You'll find it's a switch to economy when you switch to BullDog Safety Switches. Consult your qualified electrical contractor or BullDog field engineer, or write BullDog Electric Products Co., Detroit 32, Mich.

© BEPCO

IF IT'S NEW... IF IT'S DIFFERENT... IF IT'S BETTER... IT'S **BULLDOG**

ELECTRIC PRODUCTS COMPANY

A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, N. Y. • *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Road, Toronto 15, Ont.

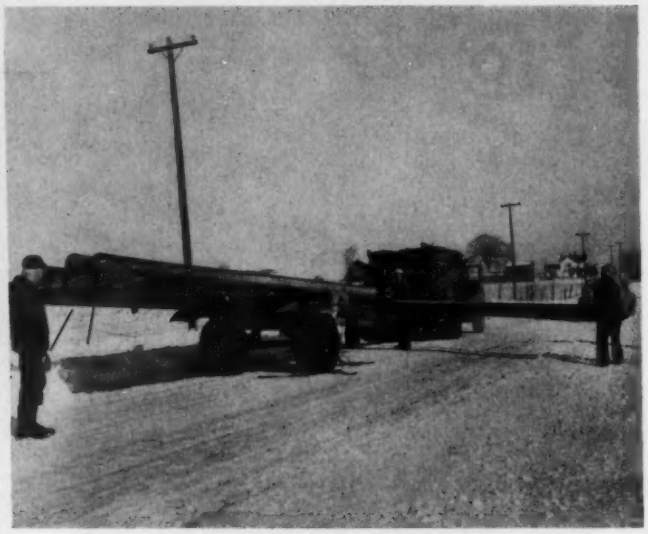
CONSULT THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

COAST ELECTRIC & MANUFACTURING CO.
1733 N.E. Seventh Avenue, P.O. Box 7712
Portland 12, Oregon

YOUNG ELECTRIC & MFG. CO.
2134 Curtis St.
Denver 2, Colorado

SAFETY SWITCHBOARD COMPANY
910—89th Avenue
Oakland 21, California

BULLDOG ELEC. PROD. CO. OF LOS ANGELES
2885 E. Washington Blvd.
Los Angeles 23, California



At left, hardware for crossarm is installed. At right, two men easily lift the 150-lb pole from carrier. Wood would weigh 520 lb

Line Material and Gar Wood introduce

Fiber-Glass Poles

An announcement of considerable importance to the electrical utility industry was made late in March when Line Material Co. and Gar Wood Industries revealed that a new Fiber-Glass utility pole has been developed and tested for a year.

Manufacture of the pole is by Gar Wood Industries and testing has been done by Consumers Power Co., Jackson, Mich. Line Material Co. will sell it.

Albert R. Waehner, Line Material's director of product management, said the product is made of filaments of fiber glass having a tensile strength in the range of 100,000 psi and reinforced with epoxy resin to form tubular columns.

He said, "Yield and ultimate strengths of the columns are so close together that they can be stressed to any limit short of actual failure; yet they will not distort or set permanently."

The new poles weigh from one-fifth to one-third as much as equivalent wood poles and are expected to have a life of 50 to 100 years.

Among the advantages cited is uniform strength which will allow scientific engineering of the size of structure needed for specific applications. Also, it is probable the poles can be made fluorescent or reflective for highway safety on street lighting standards and other applications.

To test impact strength, weights of 200 lb were dropped 10 to 15 ft without damage to the specimens while wood poles of the same class were snapped under the same impact.

Fiber-Glass crossarms can be attached to the pole by factory-drilling a 5-in. hole in the pole so the crossarm can be inserted and bolted into place. Another method of attachment is to utilize metal gains. For dead-end construction the assembly is much the same as for wood poles and crossarms. An 8-ft long, 5-in. OD, Fiber-Glass crossarm weighs only 11 lb.

One benefit mentioned is that the poles are impervious to the woodpecker—the utility's perennial foe. They cannot cling to smooth fiber glass.

(6) Write to Line Material Co., 700 W. Michigan, Milwaukee 1, Wis.

Detachable ring step used by lineman here

Artist's drawing of fiber-glass assemblies

He's coming to help you

He is a Bell System communications engineer. His purpose is to help you speed your operations, cut your costs and improve your service—by making sure your communications meet your exact requirements.

The Bell System offers a wide variety of private line services, including telephone, teletypewriter and mobile radio systems. And the Bell System tailors these facilities to meet specific individual needs, so that you maintain high-speed contact between your various departments, branches, factories, warehouses, as well as between you and your suppliers, customers, distributors and shippers.

Why not let a Bell System communications engineer make a study of your communications requirements and recommend the kind of service, or a combination of services, which will best meet your specific needs?

• • •

His survey is free and his recommendations are yours without obligation. You can reach him by calling your nearest Bell Telephone business office.

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER TELEMETERING AND REMOTE CONTROL CHANNELS

DISTRIBUTION TRANSFORMERS

THIS CONNECTOR

COULD SAVE YOU...$60

Estimate your possible savings in terms of all transformers on your lines

It's an old story to many utilities—customer complaints about radio or TV interference. And it's an expensive story, too—at an average of $30 a service trip. In fact, it often takes a couple of calls—for a total of $60—before the real villain is revealed. That villain is "cold-flow"—the tendency of aluminum to yield causing loose connections. A little multiplication of the number of transformers on your lines will prove that "cold-flow" can be a costly nuisance.

G-E connectors save you those service trips. G-E connectors counteract "cold-flow" of aluminum conductors, give an extra-tight grip on copper conductors. Low-voltage bushings have two coned-disk stainless steel washers which automatically maintain high pressure. High-voltage, tank-wall bushings achieve the same result with an internal, stainless steel follow-up spring.

Even if you don't use aluminum conductor, you still want assurance of tight connections. The new G-E connectors can save costly service calls.

Look at the other money-saving features offered by G-E distribution transformers: **Impulse testing** saves years of transformer life. **One-piece clamping bands** save maintenance time. Reusable **Nitrile rubber gaskets** help save units from contamination. **Strenicor terminal clamps** save terminals from breaking. **Super Melaglyp paint** saves up to two repaintings. **Nationwide warehouses** save utilities heavy inventory expense. **Service shops** can cut your repair and rebuilding costs.

For the complete story contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Section 431–39, Schenectady 5, New York.

dollar-saving features prove ATANA*

***ALL TRANSFORMERS ARE NOT ALIKE**
(make this simple comparison and see)

FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	√			√		√
Nitrile rubber gaskets	√					√
One-piece clamping band	√					
H-v and l-v terminals handle both copper and aluminum conductors	√					
Strenicor pressure terminal clamps	√					
Super Melaglyp paint	√					
More than 100 warehouses	√	√				
Nationwide, company-operated service shops	√	√				

Progress Is Our Most Important Product

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

read all about it!
HOLAN
Heavy-Duty
DERRICK
LIFTS LOADS TO 12,000 POUNDS
If you have big ideas for a derrick, the Holan 3700 has the muscles to carry them out. Front- or rear-mounted, the 3700 lifts loads to 12,000 pounds . . . sets and handles poles up to 75 feet long.
Write for the new 3700 catalog that tells all about it.
J.H. HOLAN CORPORATION
4100 WEST 150th STREET
CLEVELAND 11, OHIO
OTHER PLANTS: GRIFFIN, GA.; PHOENIX, ARIZONA; BRANTFORD, ONTARIO
To: J. H. Holan Corporation
4100 West 150th Street
Cleveland 11, Ohio
Please send me the factual technical bulletin about Holan's 3700 Power Derrick.
Name Title
Address
City Zone State

(7) **TRANSISTOR RADIOS can do more than provide good music. The Raytheon Mfg. Co. unit pictured here is being used in the Toledo-Edison Co. voltage regulation department to locate poor connections in power receptacles**

Weatherproof Switch Case

(8) International Register Co., 2620 W. Washington Blvd., Chicago, Ill.

This company offers a new raintight case for several series of Intermatic time switches. The UL listed case is of welded steel construction with top-hinged doors. Convenient knockouts provide access to terminal blocks.

Telescoping Hot Stick

(9) Orchard Industries Inc., Hastings, Mich.

This fiber glass hot stick telescopes from 4½ ft to 28 ft to allow linemen to work from the ground in many cases. Weighing less than seven pounds, the pole is completely nonconductive.

Pole Top Bracket

(10) Lapp Insulator Co. Inc., LeRoy, N. Y.

A new pole top bracket by this manufacturer is designed for use with a new line of 20- and 27-kv distribution post insulators, and for subtransmission service with insulators up to and including 35 kv. Recommended for use within conventional pole top construction with crossarms or for construction with insulators mounted horizontally directly to pole.

Isolated-Phase Bus

(11) I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Philadelphia 30, Pa.

This all-welded, aluminum basic assembly isolated phase bus is said to introduce new advantages for safely conducting large concentrations of power. Each basic assembly has two supporting rings for rigidity and quick alignment. A new telescoping, two-way sliding cover provides easy opening for inspection.

Open-center Load Handling

(12) Towmotor Corp., 1226 E. 152nd St., Cleveland 10, Ohio

Handling of reels of wire and cable and other open-center loads is improved with the development of two attachments for this company's lift trucks. One attachment is a pole-line ram attachment, placed horizontally, that enters the center of the load; the second is the unloader which is a pusher device to slip the load from the ram. The ram lifts and tilts for pick-up and carry loads and is interchangeable with forks.

Adequate Wiring...

GUIDE TO GOOD SCHOOL PLANNING FOR TODAY AND TOMORROW

ARCHITECTS—CONSULTING ENGINEERS
Adequate Wiring serves as a dependable guide to the specification of all the electrical equipment used in a school. A reputation for Hubbell-quality is the architect's assurance of safety, dependability and service.

SCHOOL ADMINISTRATORS
Electricity plays a steadily growing part in the functioning of our schools and education of our children. Foresighted school authorities answer the electrical needs of today and tomorrow with Adequate Wiring. Only Hubbell-quality equipment and supplies fit this pattern.

TEACHERS
Naturally we don't specify equipment but, believe me, our influence is felt by those who do. We judge equipment by its performance. Whether it's a chalk board or an electrical switch, only a standard of Hubbell top-quality earns a passing grade in our classrooms.

HILLSDALE HIGH SCHOOL
SAN MATEO, CALIFORNIA

Supplied Throughout With Hubbell Wiring Devices

ELECTRICAL CONTRACTORS
Anyone concerned with the specification or purchase of school equipment should keep in mind the ratio of cost to service. Only a standard of Hubbell-quality that answers the needs of today and tomorrow is an economical buy in the long run.

The following San Francisco firms were associated with the planning and building of the Hillsdale High School, above:

ARCHITECTS & ENGINEERS
John Lyon Reid & Partners

ELECTRICAL ENGINEER
William Laib

ELECTRICAL CONTRACTOR
Pacific Electrical and Mechanical Co., Inc.

HUBBELL SUPPLIER
Incandescent Supply Co.

HUBBELL SUPPLIERS
Prompt availability is an important factor in any building job. Our responsibility is to handle and stock the highest quality electrical supplies and equipment . . . items measuring up to the Hubbell standard . . . that provide long term dependability.

AVAILABLE NOW
LATEST ISSUE OF
HUBBELL WIRING DEVICE CATALOG
AIA FILE NO. 31-C-7

Specification Grade
Flush Toggle Switch
CAT. NO.
9801
One of the dependable top quality Hubbell devices installed in the Hillsdale High School.

Harvey Hubbell, INC.

DEPT. W **Bridgeport, Conn.**

FACTORY WAREHOUSE LOCATIONS ASSURE NATIONWIDE STOCK AVAILABILITY

State and Bostwick Sts.
Bridgeport 2, Conn.

37 South Sangamon St.
Chicago 7, Ill.

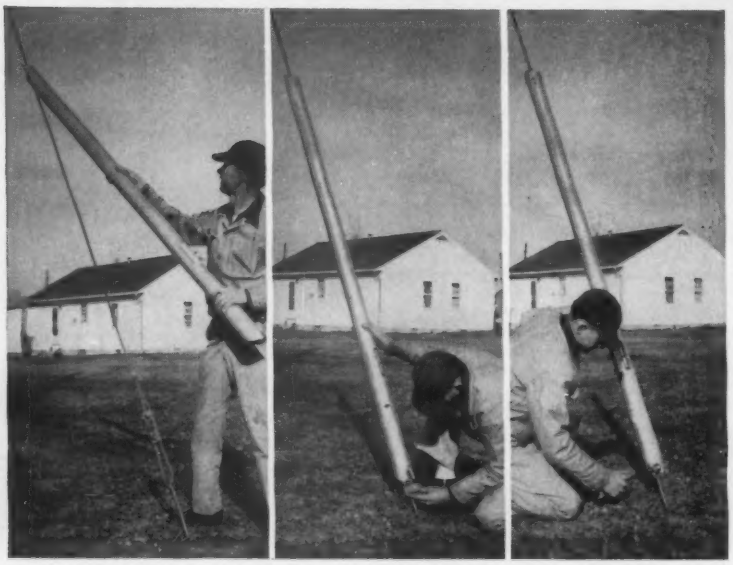
103 North Santa Fe Ave.
Los Angeles 13, Calif.

1675 Hudson Ave.
San Francisco, Calif.

1111 Dragon St.
Dallas 7, Texas

Tighten only 1 easy-to-reach bolt to install the CHANCE MONO-BOLT GUY GUARD

When a groundman installs a Chance Mono-Bolt Guy Guard, he has only three things to do:



1 Slip the flanged hook over the guy wire.

2 Place clamp on anchor rod and slide it into the slot at bottom of guard.

3 Tighten this one bolt at the *lower end of the guy guard.*

It's that easy—your men don't have to be extra tall—there's no stretching for high bolts to tighten . . . the Mono-Bolt clamp securely grips the anchor rod with a firm 3-point gripping action . . . only a single wrench is needed. Easy installation makes for proper installation.

Heavy gauge steel guard is hot galvanized for long life and high visibility.

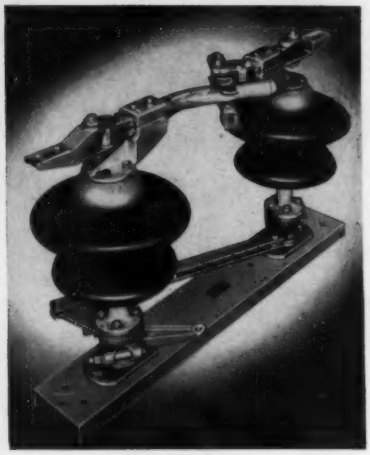
Mono-Bolt Guy Guard comes in half or full round construction, in 7 and 8 foot lengths. Fits any size rod from ½" to 1¼".

CG56-9

Phantom view of FULL-ROUND and cross section above shows how Mono-Bolt Clamp grips anchor rod and guy guard

A·B·CHANCE CO.

CENTRALIA, MISSOURI • San Francisco, Cal. • Pittsburgh, Penn.



Side-Break Switches

(13) Delta-Star Electric Division, H. K. Porter Co., 2437 Fulton St., Chicago 12, Ill.

High pressure contacts and low friction swivel terminals are featured in this company's new braidless side-break switches. The line also includes center-break, single-break and double side-break switches in a wide range of voltage and ampere ratings to 1,200 amp.

Safety Helmet

(14) Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa.

This safety helmet has been redesigned to meet all specifications under schedule No. AP-1 of Edison Electric Institute, according to the manufacturer. It is dielectrically tested at 15,000 v for one minute and shows less than 8-ma leakage, it is reported. Said to withsaid 40 ft-lb impact tests without losing any of its dielectric strength.

Volt-Ohm-Milliammeter

(15) Phasotron Instrument & Electronic Co., 151 Pasadena Ave., South Pasadena, Calif.

This company announces the manufacture of a new volt-ohm-milliammeter with meter movement protection up to 500 times overload. Uses only two jacks for all measurements and has separate range and function switches and an insulated zero adjustment. Scales are color coded. Permanent accuracy is said to be 3% d-c, 4% a-c. Measures: 1.5 to 1,500 v d-c at 20,000 ohms per volt; 1.5 to 1,500 v a-c at 2,000 ohms per volt; d-c current from 50 UA to 15 amps; a-c current from 1.5 ma to 15 amp; and other measurements. Weighs 2 lb, 13 oz.

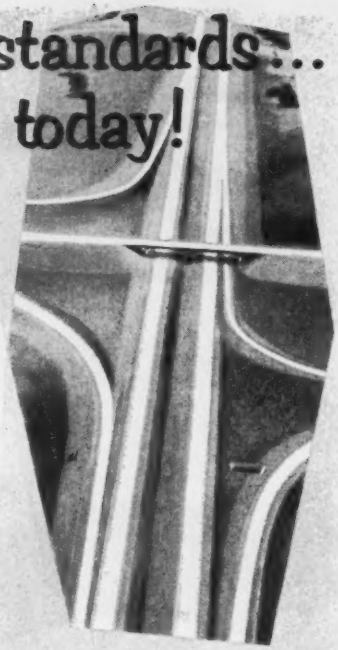
The "General" commands an army of experts,
backed by expanding resources.
He is at your service.

General Cable... *at your service!*

LIVE BETTER . . . ELECTRICALLY!

GENERAL CABLE CORPORATION, 420 LEXINGTON AVE., NEW YORK 17 • OFFICES AND DISTRIBUTION CENTERS COAST-TO-COAST

tomorrow's standards... today!



The Ohio Turnpike is the newest link in a national chain of superhighways that will eventually tie East to West. The most modern concepts of traffic engineering are reflected in the construction of this magnificent road. What transformers are used for service and lighting? Marcus, of course!

Electrical contractors:
Amon Electric Co., Warren, Ohio
Peterson-Webster Electric Co.
Youngstown, Ohio

Marcus TRANSFORMER CO., Inc.
RAHWAY, NEW JERSEY
"Mark of Quality"®
Representatives in Principal Cities

A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU 5000 KVA

SURGICAL LINE CLEARANCE BY DAVEY

Davey is doing line clearing for 12 Public Utilities on the Pacific Coast —most of them served continuously for over 20 years. Davey specialized equipment and efficient methods save money . . . Davey surgical pruning benefits trees—builds goodwill.

DAVEY LINE CLEARING
DIVISION OF
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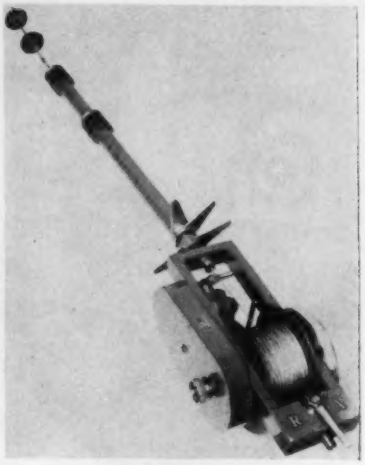
DAVEY
ORIGINATORS OF TREE SURGERY



Pneumatic Fishline

(16) T. J. Cope Inc., 711 S. 50th St., Philadelphia 43, Pa.

Rapid fishing of cable through underground conduit of any diameter or length is said to be possible with this portable, air-operated fishline. A flexible steel cable is shot through conduit to the target manhole by air. The propelling projectile is then removed and replaced by cleaning tools and the pulling wire or cable. The fishline is reeled back with a powerful air motor.

Heating Cable and Control

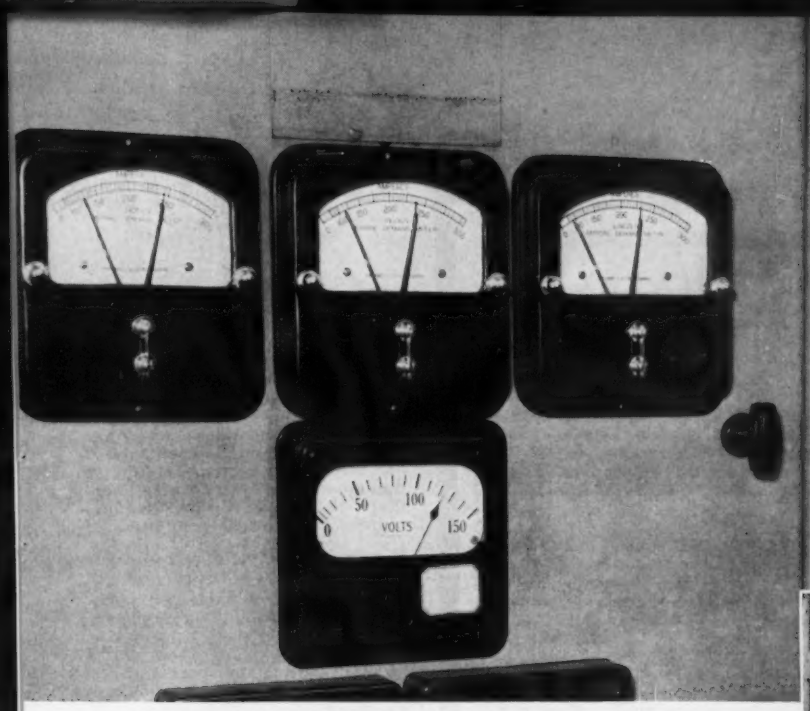
(17) General Electric Co., Wiring Service Department, Providence 7, R. I.

Improved performance in soil heating, pipe heating, roof de-icing and surface heating installations is claimed for this new vinyl jacketed heating cable. Designed for general purpose applications involving temperatures up to 200 F. Output is about 5 w per lineal foot. A new heating control with thermostat and capillary tube and bulb is designed for use with the cable.

Service-Entrance Equipment

(18) Walker Electrical Co. Inc., 125 Bennett St., N.W., Atlanta, Ga.

Flexibility of installation is the outstanding feature of this new fusible service-entrance equipment. Eight back boxes and front covers are said to fit any combinations of factory assembled interior units. The panel boards are available in 100- and 200-amp sizes, with 8 to 32 fused circuits and up to five 30- or 60-amp two-pole appliance pullouts. All wiring is straight-in and no looping is necessary.



THESE LINCOLN TYPE AD-2 Semi-Flush Switchboard Meters provide continuous information on feeder load and balance in an attended substation.

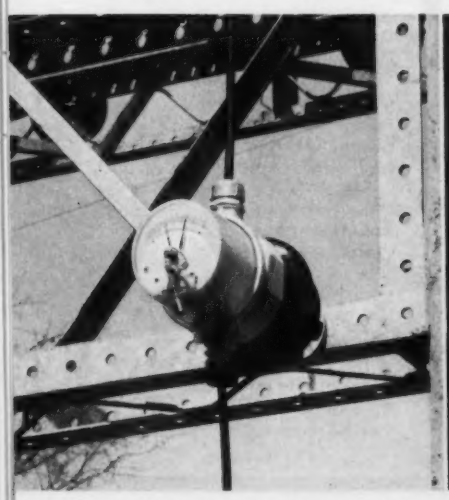
USE AD* MEASUREMENT FOR SYSTEM BETTERMENT

Helps you keep loads balanced to get the most out of system and distribution capacity

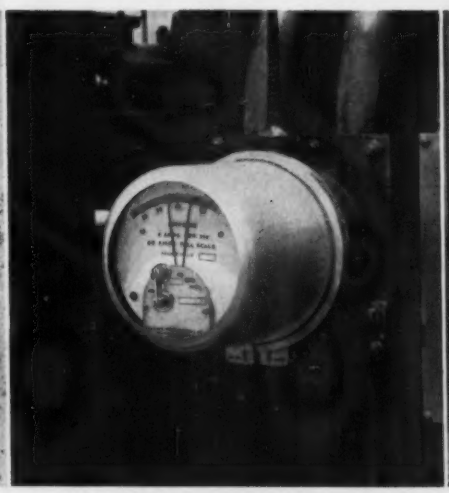
Lincoln Ampere Demand (AD*) Meters of the indicating type give you—at very low cost—the continuous information you need to load your distribution system to the ultimate safe limit. For the full story, just write Sangamo for information on "AD Measurement for System Betterment."

SANGAMO ELECTRIC COMPANY • Springfield, Illinois

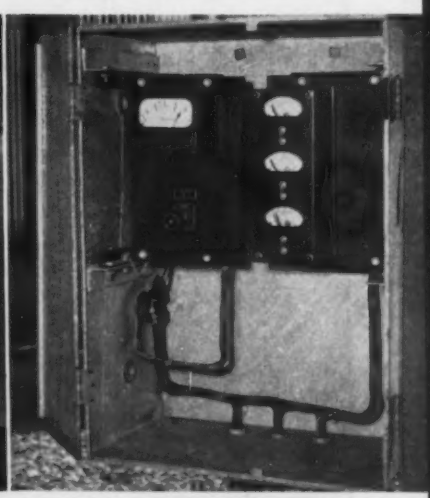
LINCOLN ADS SOCKET TYPE Meters show loading and balance on phases in an outdoor substation.



THIS "HOT" TYPE AD-5 Lincoln Meter indicates amperes and balance on primary feeder circuits. Meter is insulated from ground with a post-type insulator and is arranged for hot stick reset.



THIS LINCOLN ADN METER gives continuous facts on the load magnitude and load balance of "Y" connected transformers. No instrument transformers are necessary.



A TRIPLEX AD-2 INSTALLATION that shows load balance and current values on 4800 volt feeders in an outdoor substation.

SM56-1

BULLETINS ETC.

(19) WIRE CATALOG—Bulletin 1096 of the Okonite Co., Passaic, N. J., is a 16-page general catalog of the company's products. It gives trade names and applications, and provides two selection charts, one by application and environment and one by cable types.

(20) R. E. Uptegraff Mfg. Co., Scottdale, Pa., has issued an engineering manual dealing with its distribution transformers. It is bulletin 136.

(21) MAINTENANCE INSTRUMENTS — International Sales & Engineering Corp., Box 281, Wilmington 99, Del., has published a catalog dealing with its AEG measurements section instruments.

(22) COOLING TOWER DETAILS — Construction and operational details of the new Foster Wheeler induced draft cooling tower are described in bulletin CT-56-1. It carries perspective drawings of major equipment. Address is 165 Broadway, New York 6, N. Y.

(23) AIR CONDITIONING WIRING—Two new data sheets describing the use of Wiremold in wiring for room air conditioners are available from the company at Hartford 10, Conn. A9 and A10 deal with adequate feeders and branch circuits for room air conditioners.

(24) FLOODLIGHTING POLES — Detailed information on tapered steel and aluminum floodlighting poles is contained in a 16-page catalog available from Union Metal Mfg. Co., Canton 5, Ohio. Illustrated with pictures and diagrams.

(25) MANUFACTURERS' AGENTS DIRECTORY — Requests for the 1956 edition of the Manufacturers' Agents National Assn. directory are now being accepted from manufacturers, advertising agencies or similar firms. It will be published in July. Write to MANA at 1724 W. Main St., Alhambra, Calif.

(26) ELECTRIC HOUSE HEATING — Different methods and costs of electric heating in homes are discussed in "Electric Heating Users Guide" published by Westinghouse Electric Corp. Ask for B-6709. Address is Box 2099, Pittsburgh 30, Pa.

(27) LITERATURE DIRECTORY — Allis-Chalmers Mfg. Co., 939 S. 70th St., Milwaukee, Wis., is offering a new 24-page directory of product literature available from the company. Name of the index is "This is A-C from A to Z," or B6057.

(28) LIGHTINGWARE CATALOGS—Technical information for lamp designers, lighting engineers and architects is available in L-130 and L-110-B, catalogs of Corning Glass Works, Corning, N. Y. Wattage recommendations, fitter dimensions, brightness data, formulas for calculating illumination levels and other information are carried.

(29) TOOL GRIP SELECTOR—Mathias Klein & Sons, 7200 McCormick Rd., Skokie, P. O., Chicago 45, Ill., has prepared a "grip selector" that shows the proper Klein grip to use on all popular sizes of aluminum, steel and copper wire.

(30) FIGURING HEAT REQUIREMENTS—Simplified tables for determining electric heating requirements of homes and offices are offered by Electrovector Inc., 475 Flushing Ave., Brooklyn 5, N. Y.

KILL TWO BIRDS WITH ONE STONE — Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after June 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

If described in advertising, fill in page number

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NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... ZONE..... STATE.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

Certified Lighting for a Better America

ELECTRICAL CONTRACTORS, WHOLESALERS, LIGHT & POWER COMPANIES!

This program is sponsored by all these member companies of the Industrial and Commercial Lighting Equipment Section of the National Electrical Manufacturers Association to help you increase your sales.

These manufacturers stand ready collectively and individually to cooperate with you in every possible way to help you get the most out of this CERTIFIED LIGHTING PROGRAM. Call on them!

Abolite Lighting Division
. The Jones Metal Products Co.
Amplex Corp.
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Sell Up with PLUS FEATURES and NATIONAL LIGHTING STANDARDS

This Plus Features Check List
Sells Customers on the
MANY BIG PROFIT EXTRAS
that spell quality lighting!
Lighting "Plus Features" Check List

Now, there is a New, Easier Way to Sell More Jobs...Better Jobs...Bigger Profit Jobs!

Sell up to the standards... not down to a price! You do this and you SELL up the quality, too, when you use the tested Certified Lighting method of selling! Show the prospect the PLUS FEATURES CHECK LIST! It's the easiest way to sell *more* lighting... extra lighting that means bigger profits to you... and *much greater satisfaction for the customer!* Show the prospect the Certified Certificate. It's the easiest way to uphold the job — to keep it from being cut. That's why this certificate is so important. You can and will deliver the kind of lighting they need. It all adds up to easier selling... Write for free booklet.

Is Certified Lighting in Operation in Your Area?

This program is operated locally under the joint sponsorship of all electrical groups. If your area is listed below, get in touch with your local group... otherwise, write National Lighting Bureau.

Boston, Mass. Charlotte, N.C.
Chattanooga, Tenn.
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Rochester, N.Y. San Diego, Cal.
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Certified Lighting for a Better America

R-1192R

Certified Lighting

NATIONAL LIGHTING BUREAU, 155 East 44th Street, New York City, Sponsored by the Industrial and Commercial Lighting Equipment Section of NEMA the National Electrical Manufacturers Association

GLOBE ANNOUNCES NEW POLICY

for residential lighting sales in West

Bob Baggott

1. GLOBE appoints Bob Baggott as full time resident West coast Regional Manager for residential lighting.

2. GLOBE will sell only to a "selective" group of wholesale distributors in each area — and each will stock the GLOBE Line.

3. A system of West coast warehousing of residential fixtures will be established as soon as practicable.

4. GLOBE backs you with one of the heaviest advertising and publicity schedules of any fixture manufacturer in America.

5. GLOBE prepays freight on all residential fixtures.

6. Exciting new GLOBE line — the most comprehensive in America (outdoor, recess, ranch, modern, etc.).

7. GLOBE makes available a fabulous 48-page, full-color catalog. Fixtures are shown in actual room scenes. It serves as your showroom.

8. GLOBE gives you the industry's best packaging. GLOBE is the pioneer in modern fixture packaging methods.

9. You are assured prompt, fast delivery from our huge stock on hand at all times.

10. Every GLOBE fixture carries Union Label and is Underwriters Approved.

ATTENTION
LIGHTING FIXTURE
DISTRIBUTORS

"It's easier to sell GLOBE — than to sell against it!"

GLOBE LIGHTING PRODUCTS, INC.

P. O. Box 1122, San Francisco 1, California

See the complete GLOBE Line at our New York Showroom: 16 East 40 Street
1710 Flushing Avenue, Brooklyn 37, N. Y.

WRITE TODAY FOR COMPLETE INFORMATION PLUS A COPY OF OUR NEW FULL-COLOR CATALOG

"SPANG HD saved 25% on conduit-installation time at Jordan Marsh Warehouse"

reports John Barron, job foreman of M. B. Foster Electric Company, Boston, Massachusetts

Owner: Allied Stores, Incorporated, New York, N.Y.
Architect: David J. Griswold, Minneapolis, Minn.
Contractor: George B. H. Macomber, Builders, Boston, Mass.
Electrical Contractor: M. B. Foster Electric Co., Boston, Mass.
SPANG Distributor: Westinghouse Electric Supply Co., Boston.

The specs for the Jordan Marsh Company Warehouse at Auburndale, Mass., designed as a home-furnishing storage unit, called for a revolutionary surface conduit application. SPANG Heavy-Duty Hot-Dipped Galvanized Conduit was specified throughout the building. Here's why:

Mr. John Barron, job foreman and veteran of 38 years in the electrical field, reported: "When we look for quality in a conduit, our requirements are simple, yet exacting. We must have flexibility to permit bending and shaping without damage to the conduit. Labor is a major cost element in conduit installation, and anything which makes for a faster, easier-flowing production is money in the bank.

"There is a constant necessity of making up smaller, off-standard lengths which means cutting and rethreading of standard sections. We found that SPANG HD gives us the maximum of workability.

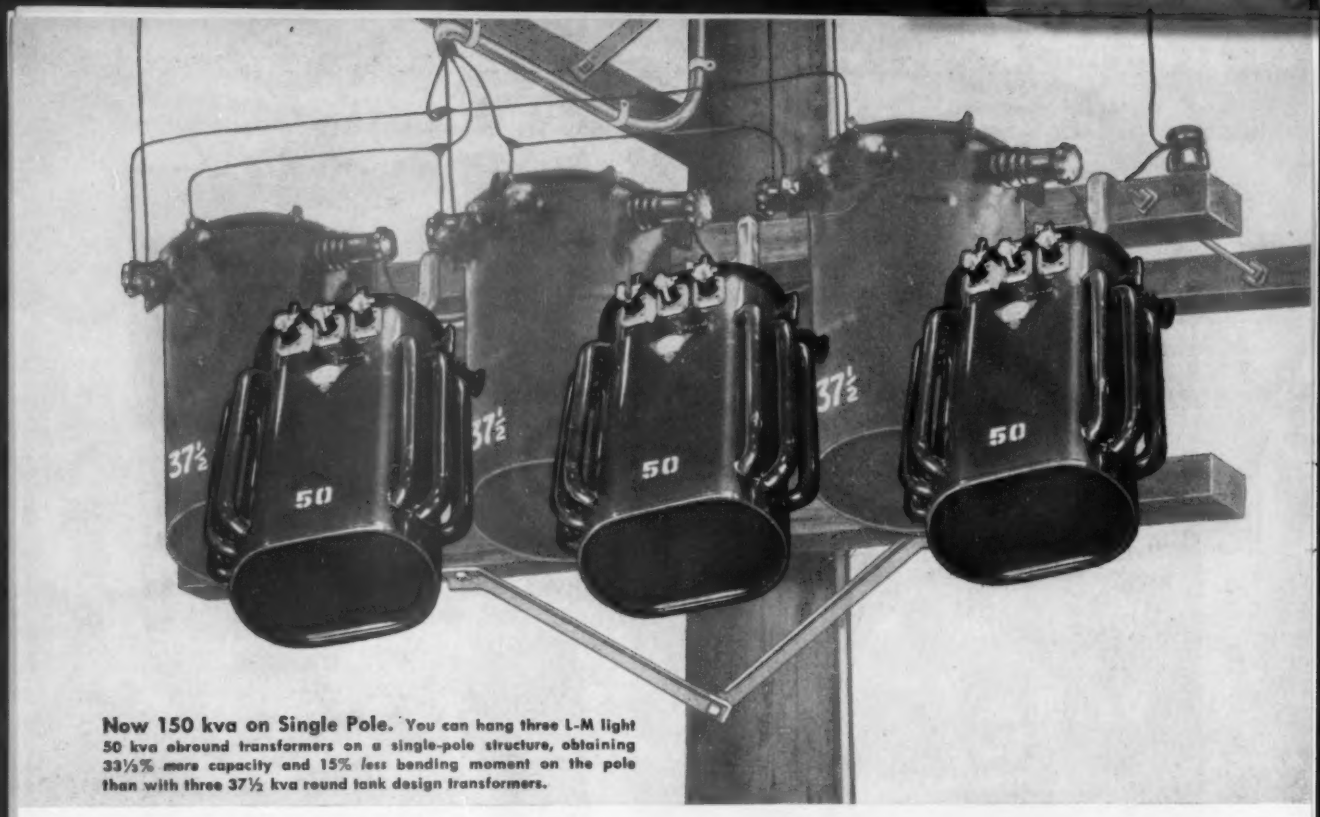
"The manner in which we receive the conduit can make a big difference in our production efficiency. . . . Nothing excels SPANG in this respect . . . all we have to do is remove the protective caps from the threads and make the installation. We know that they are clean and undamaged."

From the selection of *top-grade* skelp to the final testing and inspection of the finished conduit, SPANG Conduit is *quality-controlled*, resulting in easy bending, threading and cutting.

Cash in on SPANG's *quality-control* benefits. See your nearby SPANG Distributor. He carries the complete SPANG Conduit line—SPANG HD, SPANG Black, SPAN-GLEAM EMT.

SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities



Now 150 kva on Single Pole. You can hang three L-M light 50 kva obround transformers on a single-pole structure, obtaining 33⅓% more capacity and 15% less bending moment on the pole than with three 37½ kva round tank design transformers.

How L-M Obround Design Provides Additional Capacity On Structures

New obround tank design is smaller, lighter, has shorter moment arm, retaining all outstanding Round-Wound® performance characteristics.

By **ALVIN B. COYLE**
Product Manager
Transformers
Line Material Company

Now you can hang transformers of larger capacity on a pole structure with L-M's lighter, smaller obround transformer tank design. The additional capacity is obtained without changing outstanding performance characteristics of L-M's Round-Wound design.

Less Weight

The obround design provides a smaller tank with less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where necessary to provide the cooling surface for maintaining the same low hot-spot and top oil temperature-performance characteristics found in all other L-M transformers. In addition, the transformer's repetitive overload capacity is improved as the result of the faster transfer of heat from the coils to the cooling air.

Shorter Moment Arm

L-M's new obround design brings the center of gravity closer to the pole, which reduces the moment arm distance from the pole. The combination of lighter weight and less moment arm distance substantially decreases the total bending moment on the pole and crossarms, and thus greatly increases the potential capacity of all your transformer structures.

You can take advantage of savings such as these:

Larger transformers can be hung closer to the top of the pole, eliminating the need for a higher pole and additional spacing.

Single-pole, three-phase transformer structures can now serve more load with the additional transformer capacity available. New 50 kva obround transformers have less bending moment on the pole and on crossarms than previous 37½ kva round tank design. Here L-M's light obround transformers may eliminate the need for costly two-pole structures.

Pole-Mounted 167 kva Transformers

L-M's light-weight 167 kva transformer can be pole-mounted; provides a full 167 kva of capacity on a single-pole structure. And it, too, provides L-M's well-known overload capacity.

To serve three-phase loads you can hang three L-M light 167 kva transformers or 500 kva on a two-pole structure, eliminate expensive platforms, ground pads, or vaults in many instances, and make further use of existing facilities.

L-M's light, obround design transformers are available in single-phase 5 kva through 167 kva in each standard distribution voltage class.

Get Details On Lighter-Weight Obround Transformers

Ask the L-M Field Engineer for application information, weights and dimensions on L-M obround transformers and the exclusive Round-Wound design. Or write Mr. Coyle at Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

219-AR2

LINE MATERIAL Transformers

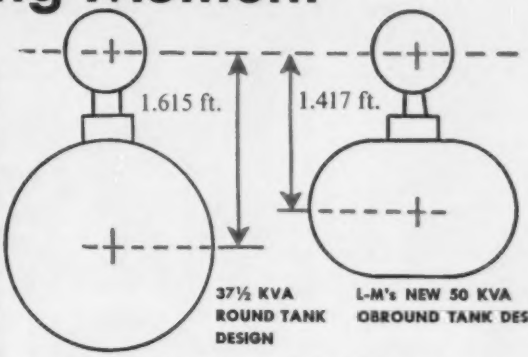
You Can Hang 33⅓% More Capacity With 15% Less Bending Moment

COMPARE 37½ kva round tank design
50 kva L-M obround tank design

37½ kva ROUND tank design:
Moment arm from center of pole. 1.615 ft.
Weight. . . . . 800 lbs.
Bending moment 800 x 1.615. . . . **1292 ft.-lbs.**

50 kva L-M OBROUND tank design:
Moment arm from center of pole. 1.417 ft.
Weight. . . . . 775 lbs.
Bending moment 775 x 1.417. . . . **1098 ft.-lbs.**

L-M's new 50 kva obround transformer has 15% less bending moment than the 37½ kva round tank design.



Less Bending Moment—New obround tank design reduces the moment arm distance from the pole. The combination of lighter weight and smaller moment arm distance greatly decreases the total bending moment on the pole. When crossarm mounted, the lighter weight substantially reduces the bending moment on the crossarms.

Less Weight, Faster Cooling—The obround design affords a small tank and less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where required to provide sufficient cooling surface.

In addition, oil ducts, located throughout the coil and between the coil and cruciform cross-section of the wound core, contribute to uniform efficient cooling.

Rapid transfer of heat provides faster cooling of the unit, increasing its repetitive overload capacity.

Plus Outstanding Round-Wound Performance Characteristics

Both the physical and performance characteristics of L-M's obround tank transformer were considered in detail. The advantages of lighter weight and shorter moment arm were accomplished with no sacrifice of outstanding Round-Wound performance characteristics.

Low Exciting Current: the continuously wound core of oriented-grain silicon steel strip provides a uniform flux path, thus permitting low exciting current.

High Impulse Strength: high-voltage windings are on the outside of the coils, providing maximum distance between the high-voltage windings and the core. This permits ample creepage distance with generous insulation.

High Short-Circuit Strength: round coils naturally resist radial short-circuit forces without damage or distortion. Sturdy core clamps and strong blocking aid in preventing axial movement of the windings under short-circuit conditions.

High Short-Time Overload Capacity: cruciform cross section of wound core and ducts between windings and layers provide excellent cooling for the entire unit.

Now you can hang 167 kva directly on the pole, yet L-M's new lightweight obround has full 167 kva continuous rating and no sacrifice in overload capacity.

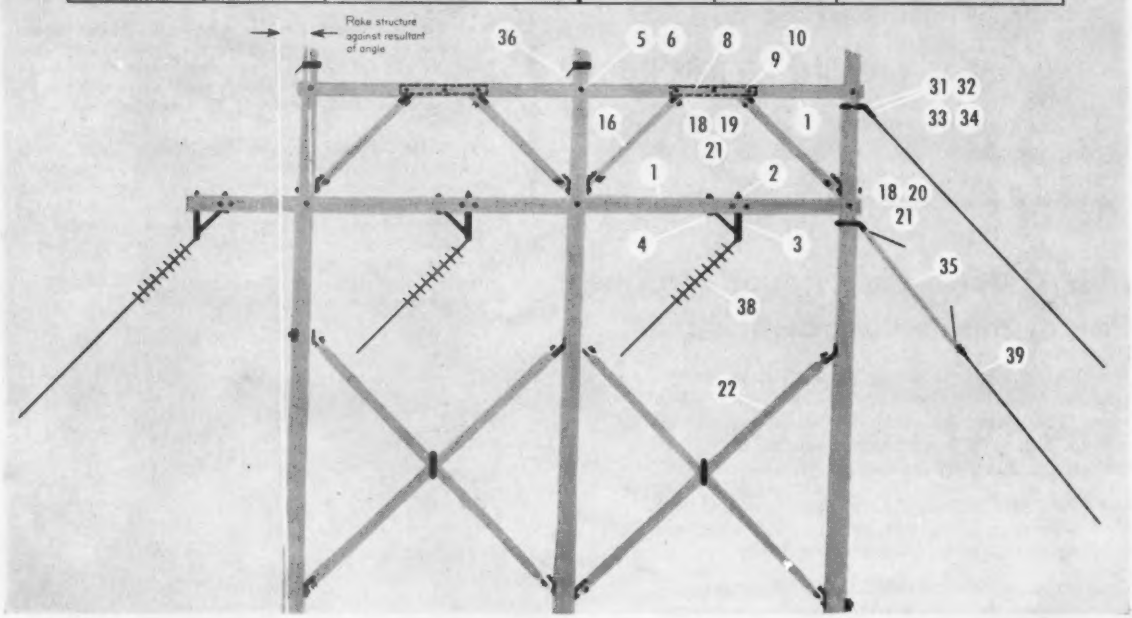
LINE MATERIAL
LM
Transformers

219-R2

SMALL ANGLE STRUCTURE TYPE NO. 706

NORMALLY USED FOR ANGLES OF 4° – 15°. ADAPTABLE FOR VOLTAGES FROM 69 TO 154 KV

DRG. REF#	QUANTITY	DESCRIPTION	DRG. REF#	QUANTITY	DESCRIPTION
706	3	Pole	21	7	MF locknut ⅞"
1	4	Crossarm	22	2 sets	Cross base w/fittings, clamp, ⅞" pole bolts, and curved washers
2	3	Spacer fitting w/mfg. bolts			
3	3	Swinging angle bracket			
4	3	Saddle w/mfg. bolts	31	4	Pole band
5	6	Stud bolt ⅞" w/2 washer nuts	32	4 pr.	Connecting link
6	12	MF locknut ⅞"	33	1	Guy roller
8	2	Filler block	34	1	Machine bolt ⅜" x 2½"
9	6	Stud bolt ¾" w/2 washer nuts	35	1	Wood guy strain insulator
10	12	MF locknut ¾"	36	2	Suspension clamp for static wire
16	4	Knee brace			
18	7	Machine bolts ⅞" w/sq. nut	38	As required	Suspension insulators and fittings
19	4	Flat washer 4" sq. x ¼". 13/16" hole	39	–	Guying material
20	2	Curved washer 4" sq. x ⅛" 15/16" hole			



FROM THE TOP OF THE POLE TO THE BOTTOM OF THE HOLE . . .

ORDER via Graybar

Graybar will deliver complete pole line structures "packaged"—ready to assemble—to the job site.

All fabricating and boring of arms has been done. Hardware is attached. You're assured that every member fits perfectly.

The result? A better structure planned and assembled according to *your* specifications.

The cost? Much lower than that of field assembly. And there's no lost motion in getting the right parts to the job on time.

To complete the "package", Graybar's experienced Outside Construction specialists and field representatives are always ready to help you tackle tough or unusual jobs along with regular service.

Remember, call Graybar *first*—for any transmission or pole line project. We'll gladly furnish help, advice, complete quotations and quality materials engineered and manufactured to assure uninterrupted service to your customers.

611-84

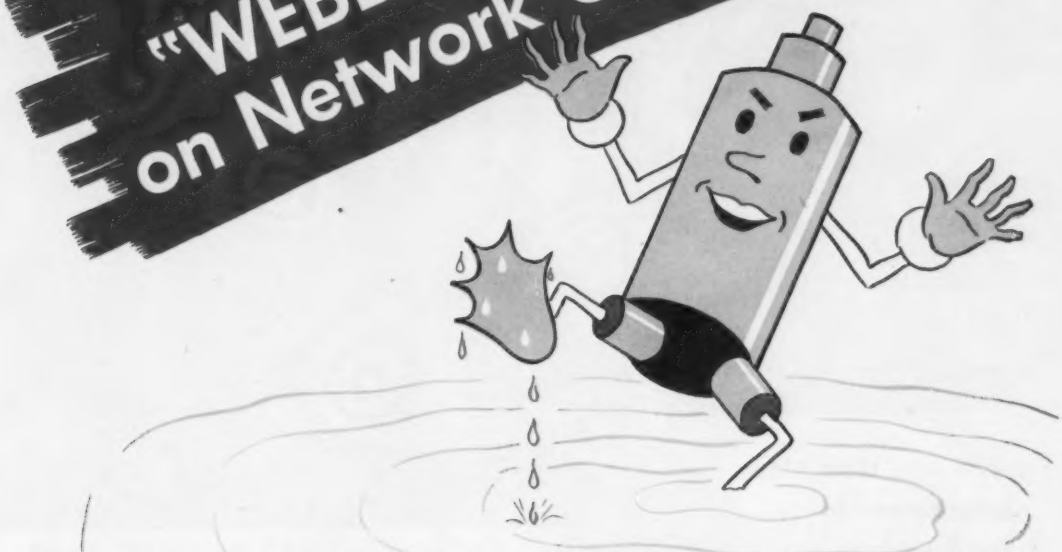
GRAYBAR ELECTRIC COMPANY, INC.
420 Lexington Avenue, New York 17, N. Y.

Call Graybar first for...

Everything Electrical GRAYBAR ELECTRIC COMPANY

IN OVER 130 PRINCIPAL CITIES

How to put "WEBBED FEET" on Network Cables



Water entering ducts floods low voltage network circuits as quickly as it engulfs high voltage primaries.

That's one reason why Simplex Network Cables are insulated with Anhydrex. It's also an excellent reason for you to buy them.

Anhydrex is guaranteed to absorb no more than 20 milligrams of water when soaked for seven days at 158°F.

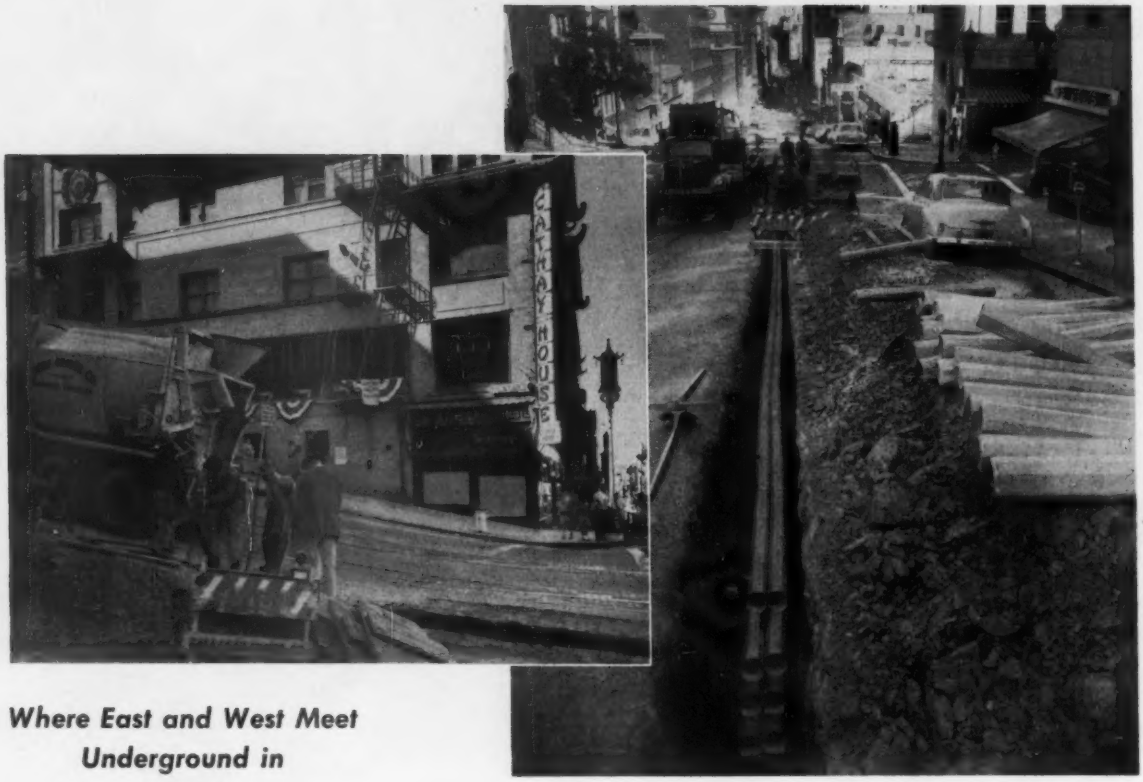
You can keep your amperes dry as a bone by getting Anhydrex-insulated, neoprene-jacketed, Simplex-ANHYDREX Network Cable. Use it for direct burial, in ducts, or above ground suspended from messenger wire.

For more information about Simplex Network Cables, write to the address below. Ask your nearest Simplex distributor about his complete line of ANHYDREX Cables.

Simplex–ANHYDREX

NETWORK CABLES

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.



Where East and West Meet Underground in in San Francisco . . .

OCT-O-DUCT SAVED TRENCHING, TIME AND TROUBLE

To get the full OCT-O-DUCT story, send for this new 12-page catalog.

From the top of San Francisco's many splendored Nob Hill, down rock-ribbed California Street to bustling, colorful Chinatown, an 8-tier run of Soapstone OCT-O-DUCT provides a new, vital telephone link.

During construction a steady traffic stream of autos, trucks and cable cars flowed up and down this precipitous thoroughfare, where grades reach 18.18 percent.

Further to complicate installation—beneath the street is almost solid rock, laced with numerous water, gas and sewer pipes at varying elevations. A narrow trench, 5½ feet deep was required.

Little wonder, then, that OCT-O-DUCT was chosen for this installation. Its short, easy to handle, 4-foot lengths, its flat sides, which enable tiering with *no* spacers, and its flexibility in by-passing underground obstructions combined to speed the project to early, economical completion.

Now, safely encased in a sturdy concrete sleeve, the eight OCT-O-DUCT runs will give dependable, permanent protection to important telephone cables in the heart of San Francisco.

Please send me a copy of your new Soapstone OCT-O-DUCT catalog.

Name .....

Position .....

Company .....

Street .....

City ..... Zone .... State .....

SOAPSTONE DUCT COMPANY

3985 Beach Street, Oakland 8, California

Distributed in the West by

MAYDWELL & HARTZELL, INC.

San Francisco, Los Angeles, Phoenix, Portland, Seattle, Spokane

GEDNEY'S RIGHT THERE IN YOUR CORNER

helping save time . . . hold down costs

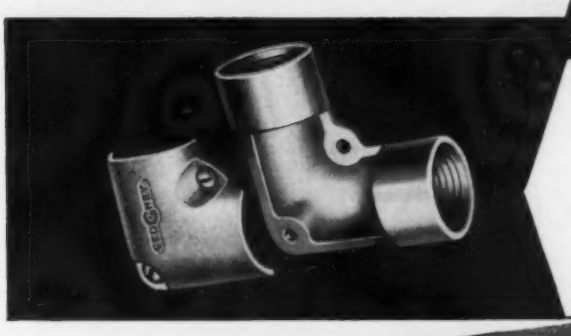
CORNER FITTINGS? Well, here are three that have proved immensely popular for the simple reason they're easiest to install—save time and labor that really counts up. Like the rest of the full Gedney line they're made of unbreakable malleable iron...accurately machined and threaded... individually inspected. Order Gedney—always—for lowest installed costs!

90° CORNER ELLS

Fitted with gasketed cover. Both ends female. Made of malleable iron, cadmium plated. Available in a full range of sizes from ½" to 2".

90° CORNER ADAPTERS

Fitted with gasketed cover. One end male, one end female. Made of malleable iron, cadmium plated. Your choice of sizes from ½" to 2".



CORNER PULL-IN CONDUIT ELLS

Today's top specification for space-saving, machine wiring, easy wire pulling. Malleable iron, cadmium plated. Sizes run from ½" to 2".

GEDNEY FITTINGS FIT

GEDNEY
ELECTRIC COMPANY

GEDNEY

RKO BLDG. • RADIO CITY • NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

ELECTRA'S HUSBAND

"Ways and Means"

"Here, sign this," I said, shoving the form 1040 at Electra. "I am glad to get that job over with."

"I'll sign it," she replied, "but how do I know it's right?"

"You don't, and neither do I. Every year the Bureau of Internal Revenue keeps telling us that they make the forms more simple and every year they just keep getting more confusing. I don't think they ever heard of standardization down in Washington."

"Hmmm," mused Electra as she looked at the little box marked 'Income Tax Due.' "It costs quite a bit to live in the U. S. these days, doesn't it?"

"Well," I replied, "whatever it costs, it's worth it—at least up to this time. However, the figure you see there is only a fraction of what we pay. Just think of all the other taxes you are clipped with directly, not to mention those that are hidden away in the purchase cost of everything you buy."

"Even so," said Electra, "you can't argue with the premise that it takes lots of money to provide all of the government services we demand these days. And the costs of running the government must have gone up—just like everything else."

Knowing Electra, a statement like that should have made me wary. Instead I began to get civic-minded.

"I'll agree that running a government costs money, but how do we poor taxpayers know whether we are getting our money's worth or whether we could get by with a lot less government spending? This same scene is probably being re-enacted in about 20,000,000 American homes right now and it's probably about the only time during the year that most people give more than a passing thought to the subject of taxes, except to cuss them out every time they take a really big bite out of your income. I remember how you screamed when they tacked the excise tax on your new fur stole."

"Now that you're all worked up," laughed Electra, "why don't you start a one-man crusade on the subject?"

"It's not that I object to paying taxes," I stated virtuously, "they're a necessary evil. But I am beginning to question more and more the way in which they're collected. You say the government needs money to operate, and I agree. But industry needs money too if it's going to provide all of the jobs and the good living that the economists predict for the future."

Electra is always logical when it comes to money. "Government needs so many dollars out of the national income to operate. I can't see that it makes too much difference in the over-all picture how they get those dollars. The country has to get along on what's left."

"That's the point where you and I can easily disagree," I said. "Many economists believe that the present income tax structure has already passed the point of economic return—that it's killing the goose that lays the golden eggs. Capital expansion is financed out of savings in one form or another. The savings of individuals and families represent about one-half of the potential source for new risk capital. If you prevent savings through excessive income taxes, for example, industrial expansion would slow down and the economic momentum would gradually slacken. Just take a look at this income tax table. A family with an $8,000-a-year taxable income has to pony up 32% of it for income taxes, leaving less than $6,000 a year to live on. I think you would be the first to agree that you won't make very much in the way of savings out of that at today's prices.

"There's another phase of this picture, too," I added. "Every business, except the tiniest, pays more than half of its net income in taxes. This makes the investment of any savings much less attractive on one hand and on the other pretty much prevents the small and medium-sized business from developing new risk capital of its own through savings."

"That all may be true," said Electra, "and there are few things more popular with the common people than being able to put a little aside for the proverbial rainy day. However, I think I remember of your telling me one time that the government gets about 60% of its income from income taxes. If they don't get it that way, how would they get it?"

"If I had that answer I'd probably be holding down a big executive's chair in the Treasury Department. Perhaps there is nobody in the whole country that even begins to know all about the ramifications of taxation. The point I am trying to make is that history has proved that every tax scheme reaches a point of diminishing return. Taxing liquor too heavily makes everybody bootleggers. Taxing imports too much dries up the exchange of foreign trade. Maybe the income tax structure has already penetrated into that same area. For example, look at Tom. His bank wanted to move him to New York at twice the salary but he wouldn't go because he could only keep about a tenth of the increase, and why take on a big headache for such a relatively small increase in net income? On the other hand, there are probably a lot of areas in the economy where the tax load could be increased without hurting business at all. If you want an example of that, I suggest that you could tack all the taxes you wanted to on cosmetics and it wouldn't keep you girls from loading up the least little bit."

"That's hitting below the belt," cried Electra, "and if you're such a smart tax expert why don't you figure out the best tax structure for the country? I'll bet it would be a dilly."

"I'm getting old fast enough on the job I have, and besides there are probably millions of combinations of ways to collect taxes. That's why nobody can say just which combination would yield the most revenue and hurt the over-all economy the least."

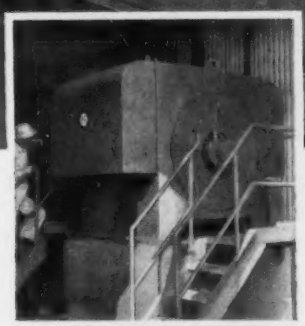
"Well I'm glad to hear, for once, that you will admit that something has you stumped," said Electra. "Would it be treading too heavily on your male dignity to suggest that the electronic brain might be the answer? From what I've been reading, they can take a million pieces of information and come up with the best answer among almost any number of combinations."

"You know that's not a bad idea," I admitted grudgingly. "I don't know whether it's ever been tried but I can't think of a better use for some of the big computers that the government has than to try to calculate an optimum revenue yield from all of the various tax sources of the country. I think I'll write an editorial about it."

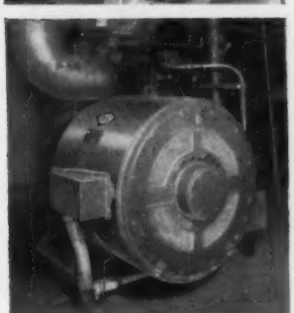
"Naturally I'll expect credit and a modest remuneration for my creative thinking," said Electra, "and while we're on the subject of high taxes and the increased costs of doing business, it costs more to run this household in the style to which you have become accustomed. How about increasing my allowance?"

Furnishing Major Auxiliary Drive Power at Indiana-Kentucky Electric Corporation's Clifty Creek Plant

Three of eighteen Allis-Chalmers 2500-hp, 4000-volt, 3580-rpm two-pole motors driving boiler feed pumps at Clifty Creek.



Rooftop installation of Allis-Chalmers 1500-hp, 4000-volt, 1185-rpm weather-protected motors. This is one of twelve Allis-Chalmers motors giving dependable service driving forced-draft fans at this modern new plant.



Allis-Chalmers 250-hp flange-mounted motor driving plant air compressor. This unusually economical mounting method for such a large motor can be attributed to Allis-Chalmers experience in motor applications throughout the electric power industry.

A wide variety of Allis-Chalmers motors furnish most of the major auxiliary drive power at Clifty Creek Plant near Madison, Indiana. Allis-Chalmers motors are driving plant air compressors, coal handling equipment, forced-draft fans, boiler feed pumps and many other pumps.

The Allis-Chalmers motors at this Indiana-Kentucky Electric Corporation installation are just a few of the complete line of motors Allis-Chalmers builds for power plant service. Contact the Allis-Chalmers district office in your area, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for complete information. A-4956

Now, You Can Get Even Greater Winding Protection with SILCO-FLEX

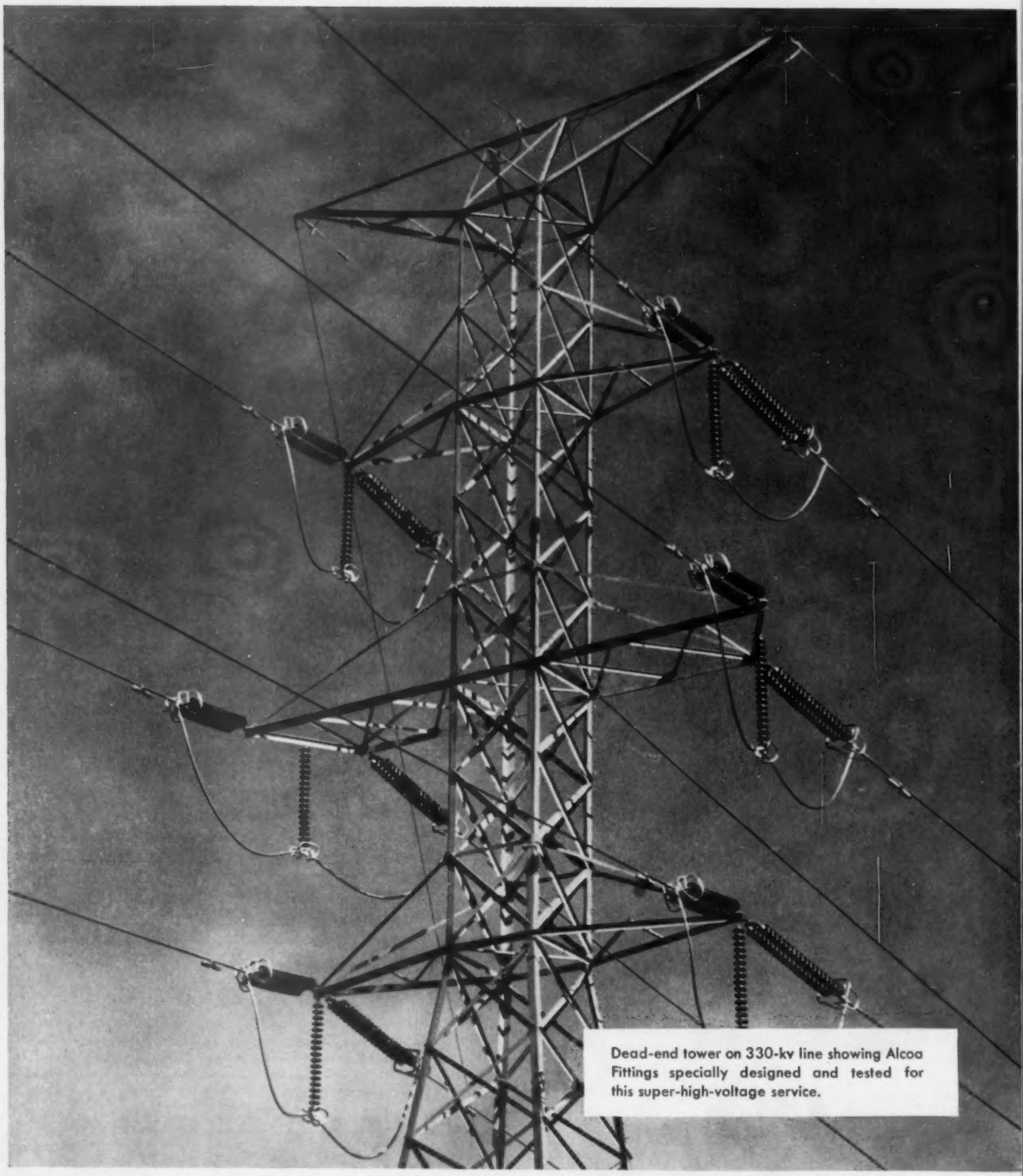
all-silicone-rubber motor insulation. Available only on Allis-Chalmers motors — in many of the larger sizes. Ask your A-C representative for the facts about this revolutionary new insulation system.

Silco-Flex is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

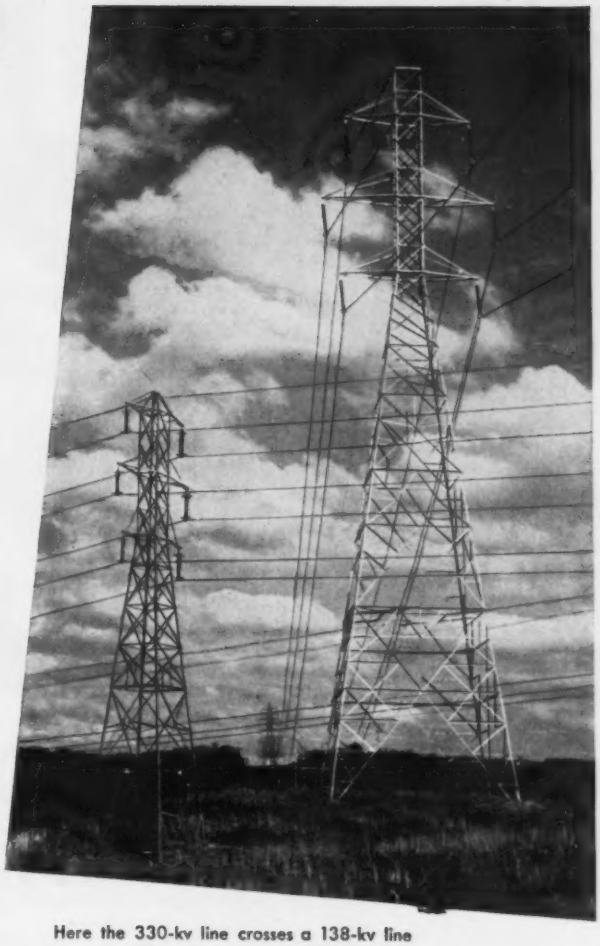
330-KV ALCOA EXPANDED ACSR LINES ON OHIO VALLEY ELECTRIC



Dead-end tower on 330-kv line showing Alcoa Fittings specially designed and tested for this super-high-voltage service.

NOW IN SERVICE SYSTEM

Diameter of 1.75 inches and high voltage set new mark for United States overhead conductor



Here the 330-kv line crosses a 138-kv line . . . constructed with Alcoa ACSR more than 30 years ago.

The nearly 400-mile double-circuit lines of the vast Ohio Valley Electric Corporation system, completed in 1955, set new records for United States overhead conductor: the rated voltage is 330-kv and the Alcoa® Expanded ACSR is 1.75 inches in diameter. Similar lines, totaling approximately 330 miles, are in operation on the American Gas and Electric system.

The fundamental research in electrical conductors that made these lines possible was begun by Alcoa more than 30 years ago. Projects in high-voltage aluminum conductors go on continuously in Alcoa's research division. This research division has kept pace with the progress of rapidly increasing loads, requiring larger central stations, higher voltage and bigger conductors. And, when the electrical industry is ready for even larger voltages, Alcoa will be ready with suitable conductors.

The same Alcoa Cable and Accessories, engineering personnel and production facilities that provided these 330-kv transmission lines are always at your service. When *you* have transmission problems calling for special conductor, bring them to Alcoa. No one is better equipped to help you solve them.

Just call your nearest Alcoa sales office. Or write Aluminum Company of America, 2314-D Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

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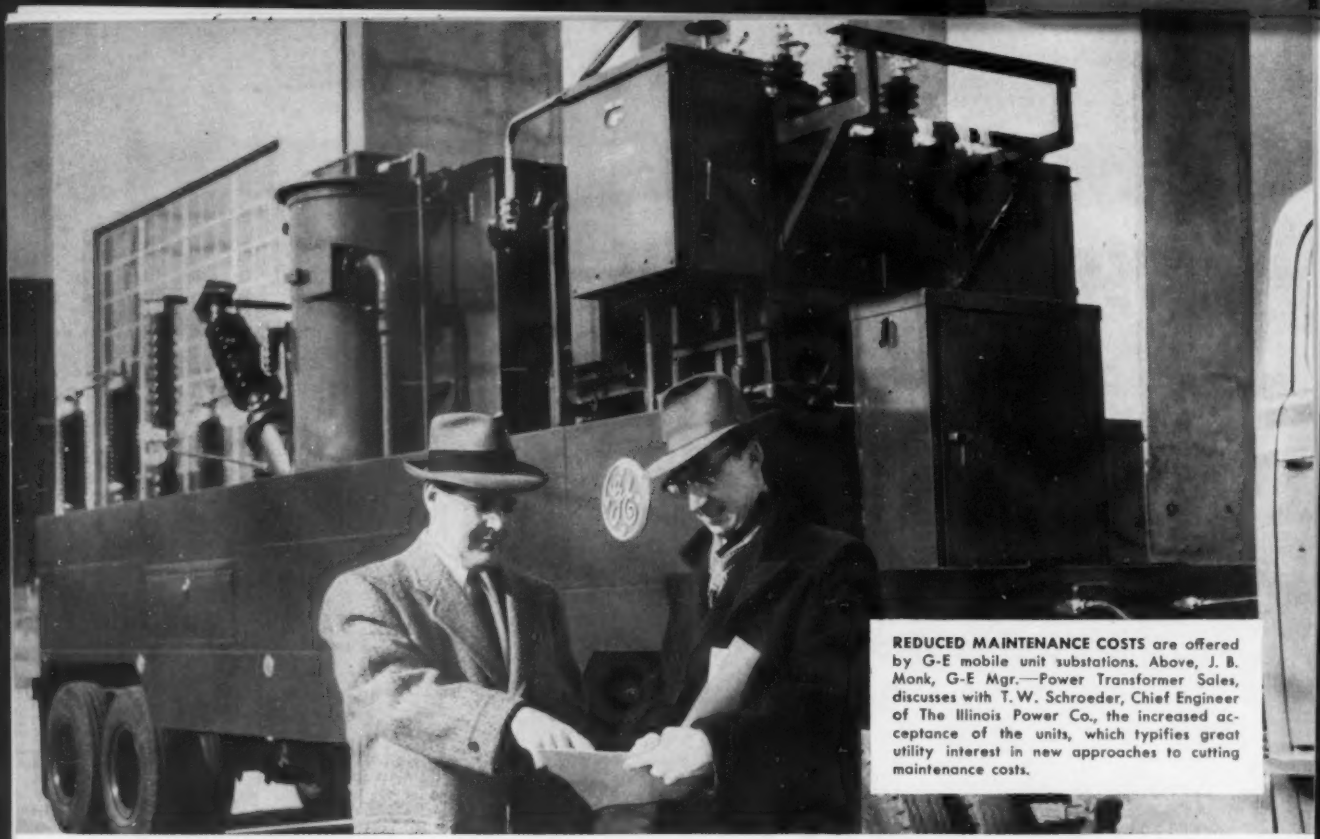
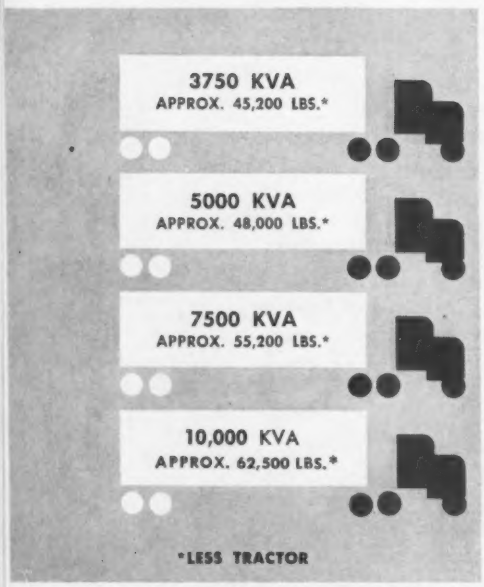
Always Use Aluminum Accessories With Aluminum Conductors

The ALCOA HOUR—Television's finest live drama—Alternate Sunday evenings



REDUCED MAINTENANCE COSTS are offered by G-E mobile unit substations. Above, J. B. Monk, G-E Mgr.—Power Transformer Sales, discusses with T. W. Schroeder, Chief Engineer of The Illinois Power Co., the increased acceptance of the units, which typifies great utility interest in new approaches to cutting maintenance costs.

Mobile substations typify utility trend to lower-cost maintenance



MOBILE SUBSTATIONS will open new frontiers for cutting expenditures for many companies. G-E units are available in a variety of ratings from 1000 to 10,000 kva. Mobile transformers have been built as large as 25,000 kva.

Recent activity indicates that many utilities have made considerable progress toward reducing maintenance costs through the development of systematic and mechanized approaches to over-all system maintenance. Rapid acceptance, for example, of mobile unit substations for normal equipment servicing, as well as for emergency service, on subtransmission systems has helped reduce routine expenditures on many systems. To further increase these savings by permitting mobile units to replace a greater number of substations, General Electric recently disclosed that it is extending the range of available ratings to 10,000 kva.

PRODUCTIVE MAINTENANCE

Impetus may be added to the growing popularity of the "Productive Maintenance" concept, a program of sensibly scheduled equipment outages, by this extended range of mobile unit substations. Upkeep expense is reduced through the use of mobile substations and mobile transformers as substitutes for regular units in need of service, thus permitting work to be done during regular working hours. Along with recent developments in automation and mechanization in the areas of generation, transmission and distribution, improvements in maintenance point up the utility industry's steady progress in reducing costs.

EXPANSION AND CONTINUITY

As customer demands for more uniform service continue to grow, and as systems continue to expand, utilities will find that often both problems can be eased greatly by sound maintenance planning. For further information on General Electric's mobile substations and how they can help streamline your company's approach to low-cost system maintenance, write for publication GEA-4415, General Electric Company, Schenectady 5, N.Y.

MORE POWER TO AMERICA 301-316

GENERAL ELECTRIC

ELECTRICAL WEST

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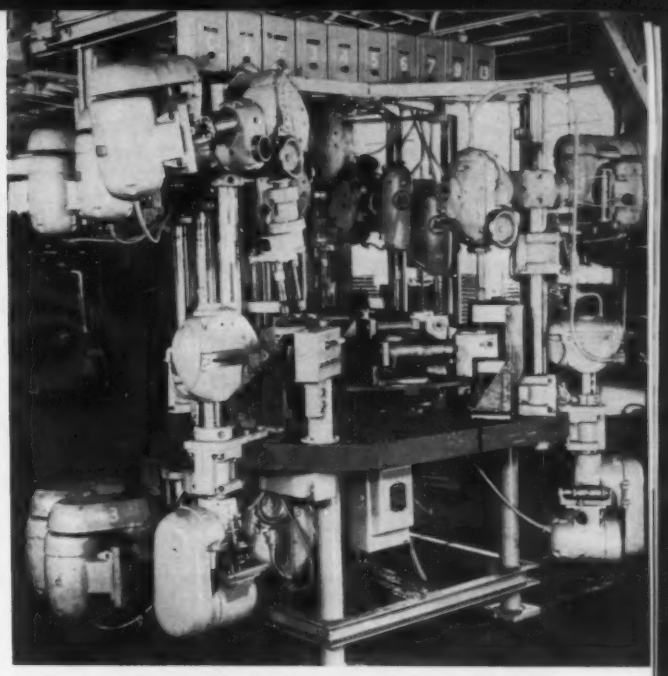
APRIL 1956

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Automation Economics

Electronic controls replace man's muscles and brain in second industrial revolution

Frank K. Shallenberger*



In this automatized machine built by the Magna Power Tool Corp. there are nine drilling heads and four tapping heads mounted around a standard index table. They perform 15 separate operations on Shopsmith headstocks. Operator merely loads and unloads and actuates cycle start button. Rate using conventional gang drilling and tapping equipment and sliding the workpiece was nine per hour. Rate on this automatized machine is 30 per hour

Automation is an industrial product, sold in industrial markets. It is new. It is expensive. It has many uncertainties. It will not be bought on style or fad, or gimmicks. It will be bought only because it offers a better, more efficient way of doing a job. The economics of automation will make or break it—it must pay off.

Fundamentally automation is a natural and logical extension of the technological change that had its origin in the wheel, the crank, the screw and other basic mechanical concepts. It is an outgrowth of the mechanization that characterized the first industrial revolution. It is a logical end to imaginative, uninhibited methods study and process improvement.

Modern automation brings important new techniques to industry—programming, feedback, computers, servos, etc. Automation introduces the principle of self-regulating control, the concept of machines to run machines. It makes possible the replacement of human judgment in the control of industrial processes. This is fine—and an important distinction. But from the dollars-and-cents viewpoint of operating management, automation merely adds new techniques to the tools of mechanization which industry has been developing over the past 150 years.

These new techniques will accelerate and greatly extend the substitution of machines for men. Automation will make economically feasible the mechanization of operations where mechanization previously was not practicable. It could make truly possible "machines without men." But to plant management it is still not basically new, and it must compete with the many other techniques of cost reduction and product improvement.

Automation has been called the second industrial revolution, a revolution in which electronic controls will replace man's brain or sensory system in the same manner as power machinery replaced his muscles in the first industrial revolution. It is said that the first industrial revolution provided machines, the second, machines to run machines; or that the first revolution was characterized by power and the second by control.

Actually we are more interested here in the economic impact of automation than in semantics, but the point should be emphasized that automation is likely to be more an evolution than a revolution. Like mechanization, it will come slowly and gradually and not overnight. And as economic historians look back on this period of our industrial development and interpret it in the terms of the grand sweep of economic history, they will note that in the mid-twentieth century "something new was added," something that greatly accelerated the application of technology to industry, something that increased the rate of productivity growth, from its traditional 2½ to 3% per year to a rate perhaps double that. They will note that, whereas extensive mechanization was feasible only in mass production industries, the development of automatic electronic controls made possible the substitution of machines for men on a much broader scale than ever before.

Automation and Management

And before we term automation the second industrial revolution, we should recognize another contender for the title, the revolution in management philosophy and practice pioneered by Frederick W. Taylor at the turn of the century. This revolution was not evidenced by material changes such as automatic conveyors, transfer machines and workerless factories, but Taylor's contribution of scientific planning and control as a substitute for "off the cuff" management was in many ways much more fundamental than automation. Taylor's proposal that management decisions be based on objective investigation and fact rather than upon hunch and tradition, his advocacy of determining in advance where you want to go and then establishing controls to make certain you get there—these were

* Frank K. Shallenberger is professor of industrial management, Graduate School of Business, Stanford University, and president, Shalco Engineering Corp. This article is abstracted from material to be published in forthcoming *Automation in Business and Industry*. E. M. Grabbe, editor. (John Wiley & Sons Inc.)

extremely radical concepts at that time —in fact are unfortunately still radical doctrines in some business quarters.

Taylor's concept of scientific management will reach its highest level in the age of the automatic plant, when long-range planning and control will be fundamental to successful operation and when electronic data processing equipment will make possible advance planning, logical decision making, and effective coordination and control to a degree which Taylor never dreamed possible.

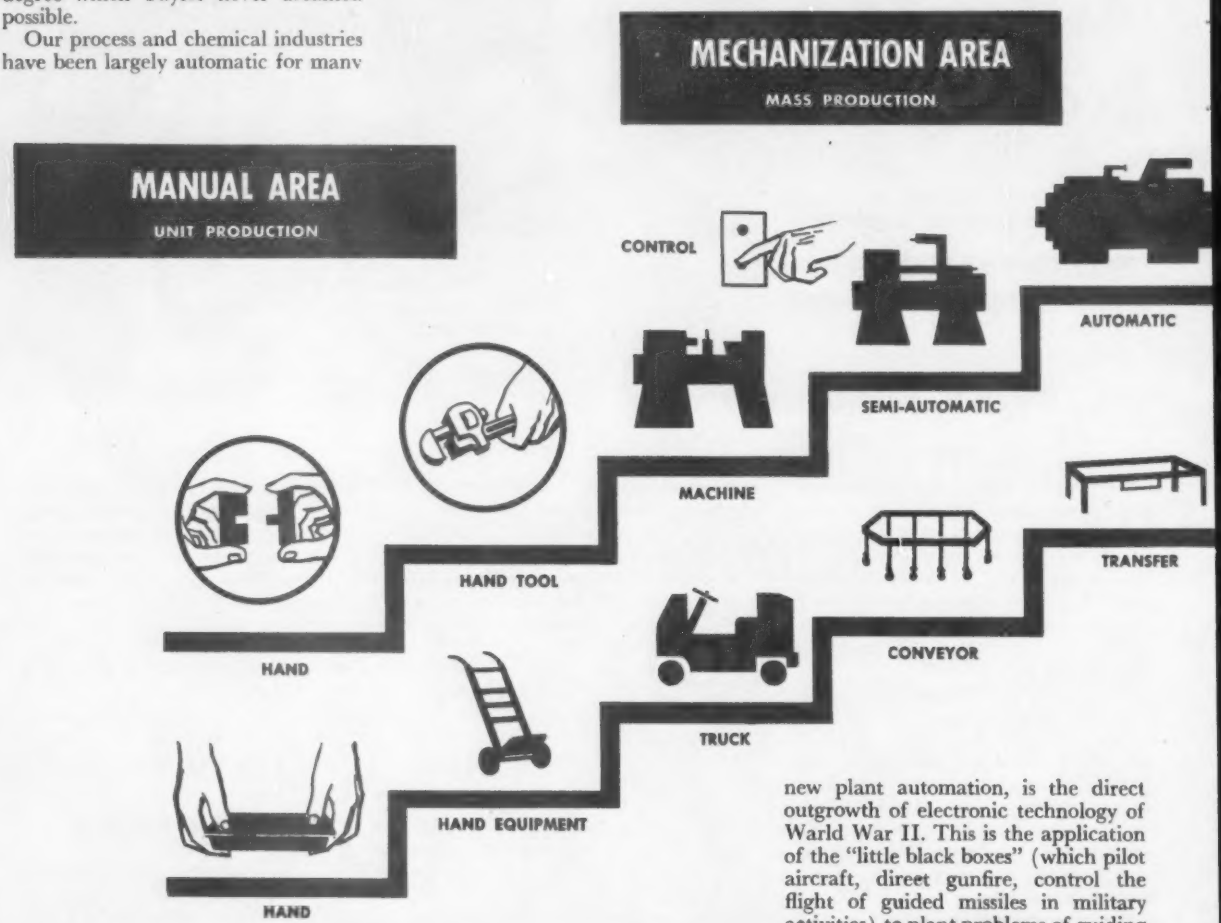
Our process and chemical industries have been largely automatic for many years; so also has been the production of bottles, tin cans, paper, light bulbs, radio tubes, cigarettes, phonograph records and many other products.

We have many individual automatic machines—automatic lathes and screw machines, automatic mills and drills, automatic punch presses, canning equipment, printing presses, bottling machines. Automatic inspection, testing, sorting, weighing and packaging equipment are already widely used.

During World War II, the transfer-type machine was developed—really a number of more or less standard machine heads coupled together with automatic handling between stations, mounted on a common base and centrally controlled.

The degree to which we are able to go in automatic production is indicated by a plant recently proposed, which I am told would have reduced floor space to one-eighth the previous requirement and the work force from 3,000 to 60. One hundred per cent automatic inspection would replace sampling and reportedly the plant would have paid off its cost in 11½ days!

These three areas of manufacturing exist side by side in many factories



The New Automation

Why is there such great interest in automation today?

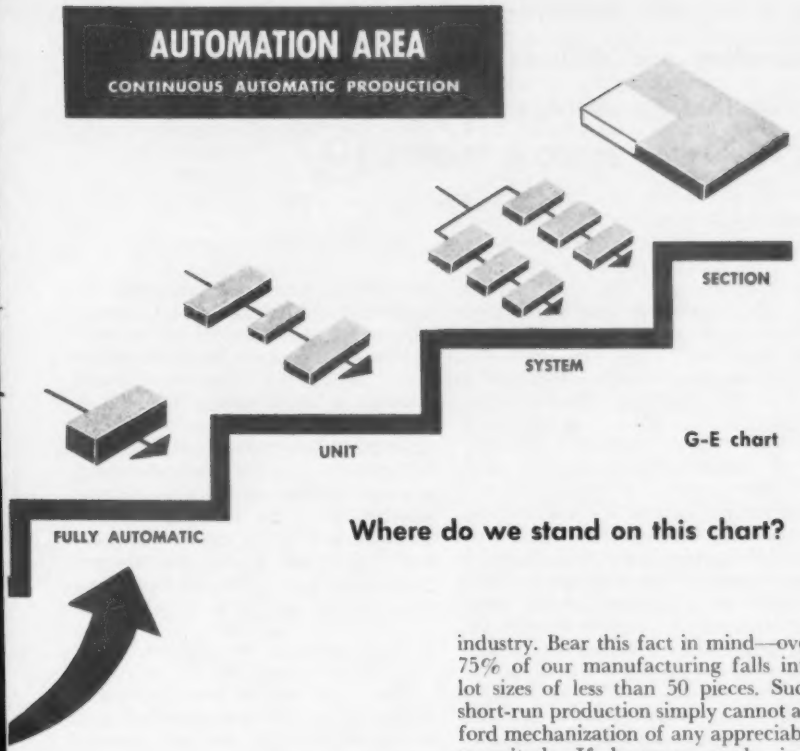
Primarily because of three phenomena:

1. Mechanization or "Detroit automation," applied thus far in only a rather narrow segment of American industry, the production of automobiles, appliances, foodstuffs and similar items of mass consumption. Mechanization is increasing at a rapid rate under pressure of increased labor costs, competition, expanding markets, high purchasing power and easy capital.

2. The technique of automatic, self-regulating control, the heart of the new plant automation, is the direct outgrowth of electronic technology of Warld War II. This is the application of the "little black boxes" (which pilot aircraft, direct gunfire, control the flight of guided missiles in military activities) to plant problems of guiding the feed and cut of machine tools, controlling conveyors, inspecting, assembling and packaging the finished product.

3. The development of computers or electronic brains which can and will automatize vast areas of clerical, statistical and administrative work.

It should be noted that the devices of automation are not necessarily electronic. Nor are they necessarily programmed, nor do they all incorporate the principle of feedback. Some represent only techniques of mechanization and are not true automation—cams, levers, air or hydraulic pistons, limit switches, relays, solenoids, etc. These



devices will be part of the automation package, too, the actuators which carry out the instructions of the control equipment.

The more recent additions to the automation kit with which the plant engineer or machine designer works are the electronic devices, which offer the possibility of programmed, self-regulating control. The ability of these devices to follow a planned sequence of actions, to make a logical choice between alternatives and to monitor their own performance and control their own mistakes, to make certain that they have performed exactly as instructed, these are the most important contributions of modern automation. The versatility of electronic controls is almost without limit. There are few if any jobs in industry they could not take over from human operators if economically warranted.

Economic Benefits

From the standpoint of industry as a whole, one of the most important characteristics of electronic controls is their high degree of flexibility. This is a fact of basic economic importance in the potential of future automation. Mechanization as it has been applied in the automobile industry is feasible only in long-run assembly line, mass-production type of operations, a dramatic but relatively small segment of industry. Bear this fact in mind—over 75% of our manufacturing falls into lot sizes of less than 50 pieces. Such short-run production simply cannot afford mechanization of any appreciable magnitude. If, however, mechanisms can be developed to carry out the necessary operations automatically and at the same time permit ready conversion to other sizes and shapes, or to completely different operations, we will have gone a long way toward solving the problem of automatizing more than just a segment of industry. Electronic controls appear to provide such flexibility.

There are many automatic processes which are inherently flexible as to product—die casting, heat treating, plating, painting, cleaning and so forth. Now electronics seems to promise similar flexibility in other areas such as machining. The best known example of this flexibility is MIT's numerically controlled milling machine in which a punched tape controls all action of the cutter in three dimensions. Within the limitations of the milling machine itself, it will duplicate or carve out any simple or complex design dictated to it by the tape.

The Arma Corp. has developed a small lathe controlled by a punched tape much like a player piano roll. A technician working directly from blueprints punches the required information into the tape by hand. Reportedly the lathe produced in four minutes a piece that required 30 minutes for a skilled machinist to make. Tape preparation required only 15 minutes; in other words, the machine was programmed and turned out its first piece in about two-thirds the time required by a skilled machinist and thereafter continued to produce at a rate of more than seven times as fast!

The estimated cost of the electronic control was $1,500, or about one-fourth the annual cost of a machinist. This machine performed only simple work and is not commercially available, but the significance of its development is apparent, especially its very high flexibility.

There are many others working on similar approaches—General Electric's record play-back control, NACA's automatic contour lathe, G&L's tape-controlled skin mill, Bendix' automatic milling machine, which it is claimed can do in four minutes what it took 400 man-hours to do before. Companies that could not afford the necessary taping equipment might send blueprints to a centralized taping service, which would then return the tapes ready for use in the same manner as photographic films are developed and printed. Changing from one job to another would be just a matter of changing tapes and tooling.

When such machines as these are coupled together with flexible automatic loading, unloading, handling, inspection and assembly devices with appropriate controls and interlocks, the automatic factory will be a reality.

The automatic plant, however, will be relatively inflexible as to volume. Equipment will be expensive. Fixed costs will be high. Labor costs will be fixed because salaried maintenance men, setup, engineering and administrative personnel must be on the job as long as the plant operates regardless of the level of operation. Material costs, too, will be relatively fixed because long-term commitments will be necessary to insure a continuous supply.

Labor Need Not Fear Automation

It is certainly true that in many cases the primary objective of automation is the elimination of labor. But will automation lead to widespread unemployment? Certainly not in the long run. Technology has always created more jobs than it has destroyed and has made possible a continually expanding economy which has absorbed more than it has displaced. While there may be some dislocations, automation promises the working force of the nation increased leisure, reduced prices, an improved standard of living, greater employment security and an economy of abundance.

Labor has clearly stated its objective of a 30-hour week. If it is successful any possible decrease in the number of jobs will be spread among the work force as a whole. Furthermore, a new

"As we automate to satisfy customer demand—and as we thus raise the jobs requiring higher education and skills in ratio to unskilled jobs—it would seem entirely possible that the average earnings of General Electric employees 10 years from now will be $8,000 to $9,000 a year."

—Ralph J. Cordiner, president

leisure market will be created, a market for home furnishings, garden equipment, sports goods, travel—creating major expansion in these industries or jobs, or both.

The economic benefits of automation are not limited to the replacement of labor. It can improve quality, decrease spoilage, increase machine and space productivity. But its greatest economic benefit and most effective sales appeal is still clearly as a substitute for human operation and control. Let us not be evasive or timid on this point. Let us be frank and honest and realistic. Let's not hide automation's greatest potential benefit—which is eliminating labor.

Automation Incentives

I have heard numerous manufacturers state recently: "We want our equipment mechanized to take the hard work and drudgery out of the operation. But where possible, we also want it automatized to eliminate the human element, to obtain consistent and predictable results which cannot be obtained when labor has control of the operation. We want to be able to know our costs in advance. We want the operation set up so the machine paces the worker, rather than the worker pacing the machine. That is as important as eliminating the worker."

It must be emphasized that there are other important incentives to automation besides reduction in labor costs. The Arma lathe, for example, through feedback control, held tolerances of .003 in., much closer than the skilled machinist could have done; thus automation produces a better product with less scrap; tolerances can become a matter of little concern. Further, automation can greatly increase operator safety. It can eliminate drudgery and improve working conditions. It can decrease space and equipment requirements by increasing machine productivity and permitting around-the-clock operation. It can make economically feasible operations and products that previously could simply not have been competitive.

It has been estimated that just to maintain our present rising standard of living we must increase our productivity 50% during the next 10 years. In other words, we must step up our annual increase in productivity from its traditional 2½% to 5%. This hardly bespeaks widespread unemployment! Only through rather extensive automation can such a demand be met.

Effect on Business

What will be the effect of automation on the business cycle? Will it reduce or aggravate the fluctuations in our economy? The evidence seems to indicate that automation will bring increased stability. It must bring stability, for the automatic plant cannot survive in a fluctuating economy. As we have seen, there will be few variable costs in the automatic plant and hence little incentive or opportunity to vary production in response to fluctuations of the market. Of course such cutbacks as may occur will be less likely to initiate a chain reaction of reduced purchasing power, for there will be few workers laid off. But the economic inflexibility of the automatic plant will necessitate investment and operating commitments which cannot be turned on or off in response to changing markets. Aided by the computer, we will develop a level of planning skill and business predictability completely unattainable today. This all leads to the promise of an employment security greater than that offered by unemployment compensation, make-work projects, guaranteed annual wage or similar devices.

Why Not Automation Overnight?

One of the greatest deterrents to automation is good, old-fashioned management inertia, especially when profits are substantial and competition is easy. A new way of doing things is always suspect from the start, for it involves changes which people make only with reluctance. There is a natural human tendency in industry to let well enough alone. A new process always brings uncertainties.

Another deterrent to modernization is archaic economic thinking. In most companies it is easier to keep an old machine working than to obtain funds to purchase a new unit, especially if the old machine has a substantial undepreciated value on the books. Before automation moves very far or very fast, businessmen must learn that book value has little or nothing to do with whether or not a machine should be replaced with a more modern machine. Obsolescence is a result of technological change and is not affected by accounting procedures. The question of whether or not a machine should be replaced by a more modern unit depends upon comparative performance in the future and not upon bookkeeping entries in the past.

Reasons for Lag

One of the reasons why automation has not progressed more rapidly is that to obtain the full benefits requires more than just superimposing automatic mechanisms on existing operations. Many existing products are simply not suited to automation in their present form. To redesign them of new materials and to re-equip the plant for their production may require extensive investigation and a major capital outlay, plus the scrapping of existing tooling and equipment. It may also require a major sales effort to gain customer acceptance of a radically new product. These expenditures constitute a hurdle not easily surmounted. There is a lesson here. Those who cannot justify automation in the immediate future may still profitably design with automation in mind to minimize change-over costs at a later date.

Labor has, of course, done its share to delay modernization, through general resistance to change, insistence upon maintenance of former piece rates and opposition to the assignment of workers to more than one machine. It has been said that the UAW is the controlling factor in the rate at which automation takes place in the automotive industry.

Taxes Retard

High income taxes and unrealistically low depreciation rates allowable under the Internal Revenue Code have also retarded plant improvement. Plant managers logically ask: "Why invite labor trouble and tie up more

capital when the government takes away most of the savings in taxes?"

These are some of the reasons why automation has moved slowly in the past and they will continue to retard it in the future. Manufacturers of industrial equipment must recognize these deterrents and design and work around them.

Incentives to Modernization

Increased competition is undoubtedly one of the greatest possible stimulants to modernization. We are today at the threshold of what appears to be the greatest capital boom in history. Widespread publicity on the benefits of automation has awakened management to the opportunities which it offers. A major portion of the current capital spending is undoubtedly for automatic equipment. A leading manufacturer of automatic equipment reports that in 1957 it will produce each month twice as many units as were produced in the entire year 1947. Each of the 1957 units will have an output approximately six times that of the 1947 model and will sell for three times as much. Thus this firm's dollar sales will have grown approximately 8,000% in 10 years. Factory sales of instruments for industrial control were reported to be $3,000,000 in 1940, $65,000,000 in 1953 and are expected to reach $150,000,000 by 1960.

Labor Cost is Big Factor

The increased cost of labor is among the most important incentives to automation. The higher labor pushes its wages, and the less predictable labor becomes, the greater the likelihood of its replacement by automatic mechanisms. The firm whose rapid growth was just described reports that anticipated wage increases are one of the most important factors in their sales forecast. The guaranteed annual wage, which labor claims is designed to help protect the worker from technological unemployment, is much more likely to become a major incentive to automation.

Labor has on the whole been rather sensible in its approach to the problems created by automation. However, it has been completely "off base" in linking the guaranteed annual wage to automation. Guaranteed employment can work only toward the replacement of the worker by the machine. Traditionally, labor has been a variable cost. Once labor costs are frozen by a guaranteed annual wage, labor becomes a fixed cost in every sense of the word and the incentive to its replacement is thereby increased.

Capital is more readily available for modernization than in the past. A new pay-as-you-go financing plan, which allows the borrower to pay for new equipment with his depreciation allowance under the tax law, has already been announced. Various other re-equipment purchase plans attempting to permit payments out of savings are available. Equipment leasing permits modernization with very little capital investment and often with substantial tax savings.

Selling Will Be the Key

Strangely, it will be the sales department and not the production function that may carry the major responsibility for the success of the automatic plant. The wheels will start to turn with the sales forecast and the over-all operating plan, which will be a responsibility of the top planning group. But on the sales department will fall the responsibility for developing and maintaining that market, the market necessary to keep the automatic plant operating at an economic level. Full automation will be practicable only in plants producing standard products in large quantities. This constitutes another challenge to the sales department, gaining consumer acceptance of highly standardized products. In most cases products will have to be entirely reconceived in terms of the function they are to perform and redesigned of new materials suited to automation. Once again this constitutes a burden on the sales department, which must overcome the market's natural resistance to radically new products.

It is clear that the challenge to sales is as great as the challenge to production, and the competence with which the sales department can meet this challenge will determine to a large degree the success of automation in many companies and industries.

Human Relations Problems

Management will have other problems to contend with besides production and marketing. Personnel and industrial relations groups will assume greater stature. Where will they find, train, develop, maintain and motivate a skilled work force made up primarily of technicians? What job satisfactions can be offered? What incentives will be appealing? What new industrial relations problems will a shorter work week or a six-hour day bring? Will the increased pressure for the guaranteed annual wage come hand in hand with automation? What is to be done with the problems of displaced workers? All of these questions loom large on the horizon.

Automation will bring with it a tremendous increase in the bargaining power of labor, both because the automatic plant cannot afford work stoppages and because as labor costs decrease as a percentage of total costs management's resistance to wage increases and fringe benefits likewise softens. There is in this a real threat for nonautomated, high labor industries, for they cannot isolate themselves from the wage pattern set in the automatic plant.

Automation is coming and no one can do much about it. It will bring change and change will bring discomfort and disruption to accustomed ways. But it also holds forth much promise. As one industrialist said: "Don't close your mind to automation —if you do you may be closing your plant."

Higher Secondary Voltages

For many years industrial customers have utilized the 480-v delta system to supply 440-v motors. Many of these industrial plants have used the higher secondary voltages on secondary networks. The number of utilities using higher secondary voltages in commercial areas is constantly increasing. There has been a trend in recent years to the use of a wye system to supply fixed building lighting as well as power.

Higher secondary voltages are both practical and economical for the user and the utility in commercial areas. Equipments are available and considerable experience has been gained.

Although no standards have been established, the Edison Electric Institute Task Force on higher secondary voltages has recommended the nominal system voltage of 256/460 for this type of load. The task force also recognize the possibility of extending the use of the higher voltage to residential and small commercial customers and therefore recommended that an intermediate alternate of 255/440-v wye for this type of service be considered.

On the basis of generalized studies and a number of specified case studies, higher secondary voltages proved economical for serving commercial loads.

The foregoing was gleaned from a paper by Robert Remington, Westinghouse, given before a recent meeting of the Pacific Coast Electrical Assn.

Explosionproof housing on closed-circuit television camera permits operation in explosive atmosphere at munitions testing station

How Man Extends His Vision

Closed-circuit television is an important new industrial tool. It has unlimited possibilities. How does it work?

C. M. Brainard

Brainard Electronics
Los Angeles

Man has conquered space by the use of jet aircraft. For years he has been able to transmit his voice to any part of the world. For years he has desired to extend and expand his range of vision. This has now become a reality through the medium of television, which may be defined as vision of a distant scene, electrically transmitted and reproduced.

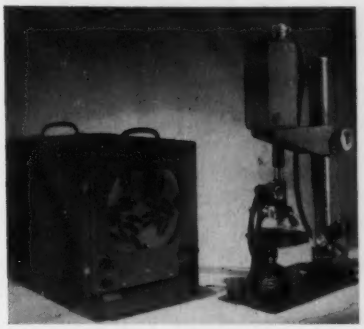
Closed-circuit television is a private system connected by wire or microwave. This type is referred to as industrial television (ITV), and differs from regular commercial television only in that it is miniaturized, ruggedized and specifically designed to meet industrial requirements.

The quality of picture obtainable with this type of equipment is better than that viewed on a home television receiver. In determining the quality possible with ITV, consider that the picture is made up horizontally of 600 dots and vertically of 500 dots. Therefore, the entire picture is made up of 300,000 dots, similar to a newspaper halftone. The more dots covering an image, the clearer the reproduced picture will be.

The camera pickup tube (Vidicon) is sensitive to the entire visible spectrum and the picture is reproduced in varying shades of grey. By the proper use of filters on the camera, colors may be emphasized or attenuated on the viewing screen. The scene is reproduced 60 times a second, which allows televising of motion. The optimum in picture quality can be obtained with 15 f-c of reflected light. While pictures are attainable with less light, the quality varies accordingly.

Applications

Industrial uses of closed-circuit television are virtually unlimited. There are two general types of application. One is for observing at close range



Equipment used making biological studies

tests, operations or experiments that could not otherwise be viewed with safety. There are many applications of this, most of which are wrapped in security, where cost of the ITV equipment is a factor not even to be considered.

Then there are the innumerable applications that must be economically justified. On the West Coast applications in this field are increasing rapidly. One of the earliest of these enabled an operator to view the discharge from a power plant smokestack. A more recent use of ITV in the utility field is for viewing remotely combustion conditions in steam boilers. This practice has now become practically standard in new steam-electric stations.

Here are other typical applications: conveying flight information to airline personnel and the public at airports; viewing the landing of planes with a camera located at the end of runways; viewing plant entrance gates; observation of employees entering a security area; dispatching in railroad yards;

Here an illuminated map is reproduced on large screen ITV viewers in various locations

Monitor, portable camera control console

Basic equipment required for ITV consists of viewer and camera. Model is RCA ITV-6

viewing of general plant operations, a particular machine operation or an assembly line; use in hospitals in connection with dangerous radiation treatments; students watching a surgical operation; educational classes, sales and executive conferences, within a plant, within a city or between cities —even nationally; at race tracks; on freeways to observe traffic conditions —and many other uses too numerous to mention.

Economics will determine the feasibility of most applications, but there are many other uses of ITV where safety, convenience and other considerations are the determining factor. Closed-circuit television systems are functional, relatively simple, inexpensive to operate and reasonable in first cost considering what can be accomplished. First cost of a basic system is less than $2,500. This is only about half the annual wage of the average worker. When savings made possible by ITV are considered it is found that many installations will pay for themselves in a matter of a very short time.

Equipment Used

ITV equipment for the great diversity of applications has been designed in a modular fashion. Components are as follows:

1. The ITV camera is a small and compact unit approximately 5x5x11 in., containing only the vidicon pickup tube and required circuits.

2. A 5-in. electronic viewfinder may be attached directly to the ITV camera, thereby producing a studio-type unit. In this application the operator stands directly behind the camera and can see the image being picked up by looking at the 5-in. electronic viewfinder. The camera is generally mounted on a tripod or tripod dolly. This equipment is generally used for teaching purposes.

3. A remote-focus unit may be attached directly to the camera. This permits optical focusing from remote locations.

4. In applications where the scene illumination is likely to vary, a remote or automatic iris can be used to properly compensate for varying scene illumination.

5. The camera uses 16-mm C-mount lenses with a large variety available, ranging from wide angle to telephoto. Zoomar lenses are available that provide a continuously variable viewing angle.

6. A four-lens turret may be used, thereby affording quick selection of the desired lens. It may be operated at the camera or remotely.

7. Various camera housings are available for varying applications. Housings are available such as weatherproof, which contain a heating and ventilating system, and windshield wipers; explosionproof for use in an explosive atmosphere without ignition are available; and special underwater housings.

8. Pan and tilt mechanisms are available either for indoor or outdoor applications. This device enables remote positioning of the camera with separate controls for horizontal and vertical movement. The unit designed for outside use is large enough to hold the above mentioned weatherproof housings.

9. Multiconductor cable is used to connect the camera to the camera control unit, which contains sufficient conductors for the supply voltages and camera controls.

10. The ITV control unit contains all of the power supplies, sweep circuits, video amplifiers and controls necessary to operate the camera.

11. A camera switching unit may be used where more than one camera is to be operated from one control unit. This allows switching to any one camera at a time.

12. A coaxial cable, RG-11/U, is connected from the control unit to any number of remote viewers. By use of appropriate amplification, the distance between control unit and viewer can be any desired distance.

In addition to these standard units, custom devices are available for applications requiring control consoles, switching panels, housings, etc.

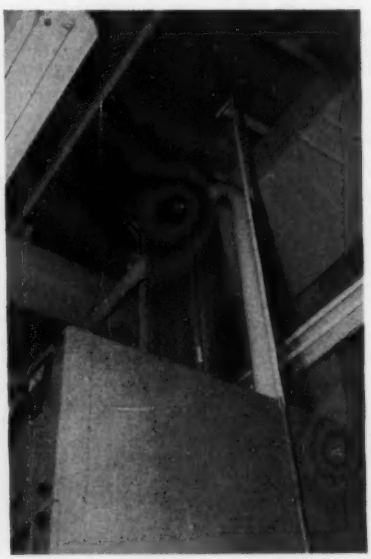
Future of ITV

From the foregoing, it is obvious that closed-circuit television has arrived with a profound impact. It will prove an invaluable tool as mechanization and automation proceed.

There is another use of closed-circuit television that could even overshadow industry in its application and that is in the home. Two useful applications already are being made. One is to monitor the front door and service entrance so that the housewife can see who is there before opening the door. The other is to view the children's nursery or playroom so that the mother can make sure that all is well. The surface has barely been scratched on these applications alone. Besides that, there are probably several other logical uses in the all-electric home of today.

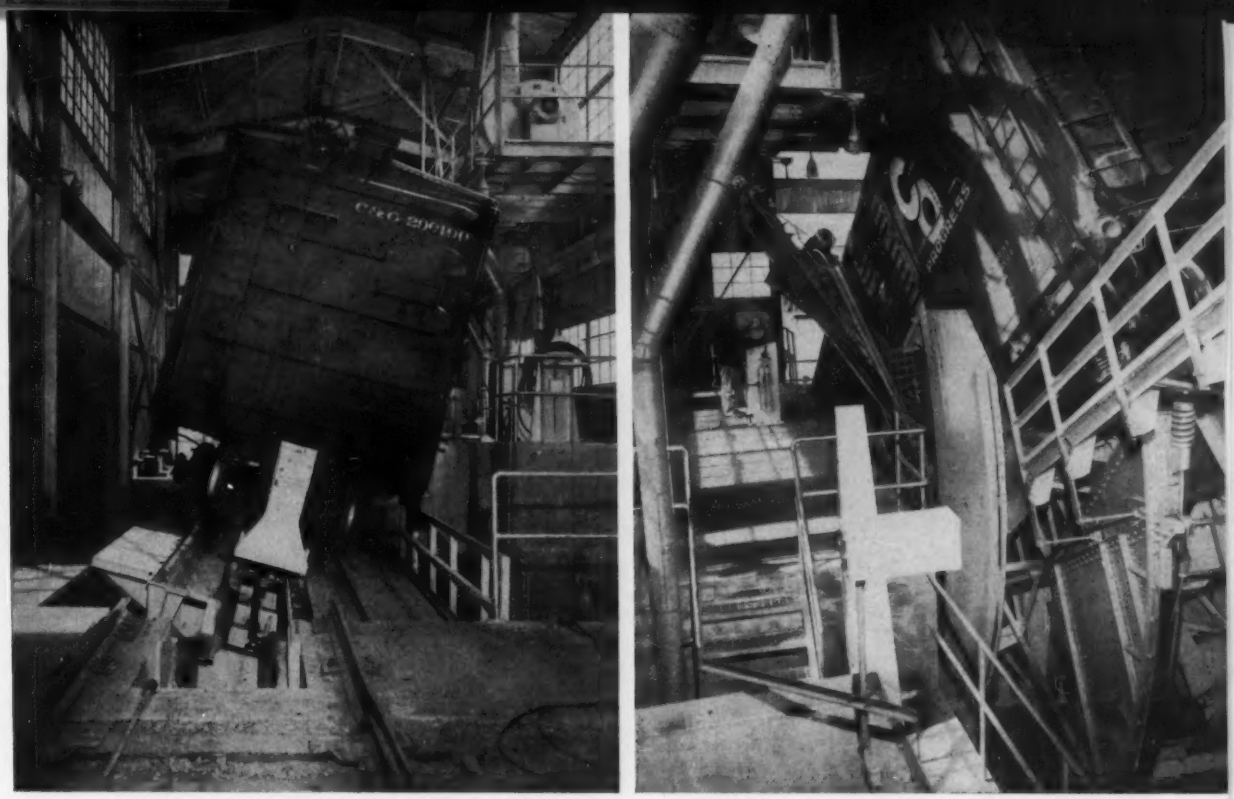
To make ITV even more useful, a significant new development has just been announced at the New York show of the Institute of Radio Engineers. A practical system has been developed for stopping and holding the picture, on a separate screen, for detailed viewing.

The future of closed-circuit television is truly unlimited!



Cable Trough

Expanded metal cable trough above switchgear panels at plant of the Scott Paper Co., Everett, Wash., is shown above. In the installation shown at left additional drop-outs can be placed at any given point without cutting or fitting. View at right shows Cope cable trough forming completely closed drop-outs for high concentration of power and control cables going into switchgear panel cabinets below.



Mechanical car dump unloads boxcars filled with grain in a fraction of the time required by the former method using power scoops

Car Dump Replaces Scoop

Kevin T. Cadigan, Portland General Electric Co.

Scoops powered by small electric motors for unloading grain from railroad cars have given way to a car dump at the city of Portland's grain handling and storage facilities. Most of the grain arrives by boxcars. Last summer the Portland Commission of Public Docks provided additional storage facilities for 5,600,000 bu and installed the car dump.

With the car dump shown, four men have replaced 20. These four men operate the car dump and empty 50 boxcars per day, or 25,000 bu per hour.

Operation

A switch engine pushes a loaded boxcar onto a movable track, a dummy coupling or end clamp secures the car to the track, the car is turned on its side about its longitudinal axis and much of the grain is emptied at this stage. Then the car is tilted on its end about its transverse axis and the remaining grain falls by gravity to the lower end of the car. The deflector then is operated so as to fence off the opposite end of the car. The car is tilted endwise again so as to raise the end that contains the grain; the grain falls by gravity, strikes the deflector and rolls out the doorway completely emptying the car.

The car dump utilizes one 40-hp end tilt, one 10-hp side tilt, one 15-hp end clamp and one ½-hp deflector motor. From the car dump the grain goes to the storage bins by an elaborate system of interlocked conveyors in the conventional manner of elevator operation.

Radical New Approach Taken

Investigate alternate distribution systems was the advice given by A. M. Lockie and H. B. Thacker, Westinghouse, in a paper before the Winter General Meeting, AIEE. They propose a primary service unit system for residential distribution to meet certain disadvantages of the conventional overhead, open-wire residential system that are becoming increasingly serious with growth of loads and system expansion. An underground system, although its initial cost is higher, is preferred to overhead because the latter is subject to damage by lightning, wind, sleet, traffic, trees and falling objects, and because it is more esthetic. To insure economical and adequate distribution systems for tomorrow's residential loads, they propose to supply energy to the consumer's premises at primary voltage; dry-type transformers permit the selection of suitable utilization voltages by means of series-parallel connections of the secondary windings; transformers and associated equipment are assembled into a suitable package unit, using an underground or semi-buried transmission system to replace conventional overhead lines.

Large-area, comparatively nondirectional light source such as this unit proved part of the solution to lighting a rail straightener

Lighting a Rail Straightener

Jerome L. Lindberg and Charles O. Bell

Colorado Fuel & Iron Corp. Southern Colorado Power Co., Pueblo

Lighting a railroad rail straightening department in a steel mill is a most difficult problem. Every rail goes through a straightener where a long sweep and small hooks and bends are removed from the rail.

Men who work as straighteners must be able to see even minute bends and be able to position the rail in such a manner that the huge mechanical press can remove the bend with one blow of just the right force. This requires that a straightener's depth of perception be flawless along the length of the 39-ft rail. Because of the great importance of the operation to plant production, the rail straightener's position is one of high incentive pay.

Past lighting experience at the plant of Colorado Fuel & Iron Corp. at Pueblo, Colo., had indicated that it was necessary that the rail be lighted by a high-intensity directional source so arranged that the straightener could sight along the length of the rail directly into the light source, as shown. This lighting system consisted of a 300-w locomotive head lamp directed along the rail and into the eyes of the straightener. If he happened to glance into the beam he was, of course, blinded by an afterimage for several seconds. He, therefore, attempted to work somewhat in the shadow of the machine, which hampered his action in turning and positioning the rail.

The Colorado Fuel & Iron plant in Pueblo has been one of the leaders in the industry attempting to solve this lighting problem, and had arrived at this method as the result of much experimentation.

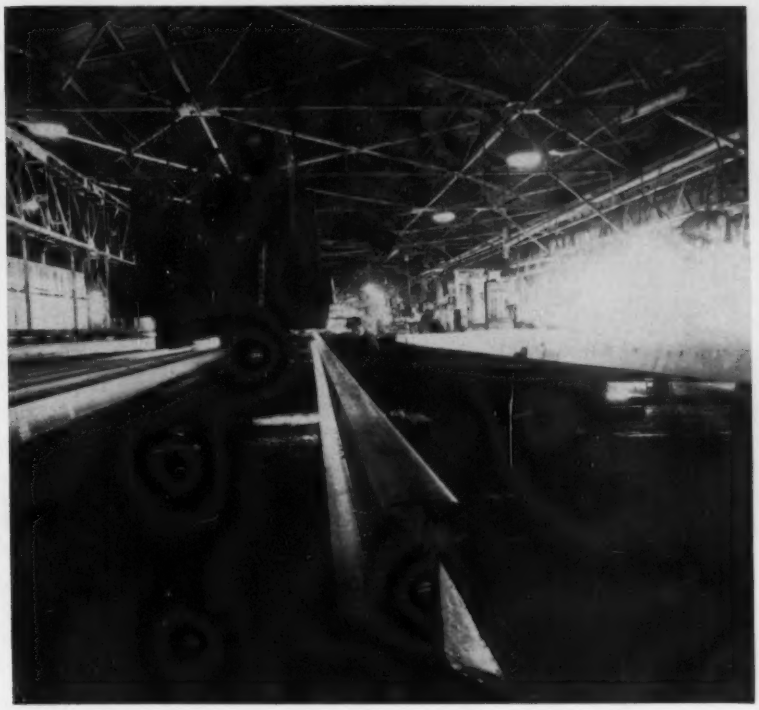
The main drawback to this system was that the straightener could work at his job only for short intervals of time before it was necessary for him to take a break to rest his eyes. If he did not take this break, his rejects began to rise with an accompanying drop in earnings.

With the lighting system just described, an average of approximately 15% of the rails that passed through the straighteners was rejected because of flaws the operator had failed to see. In the month preceding the change, 23½% rail rejects were encountered. These rejects were a considerable expense to CF&I because they had to be sent back for refinishing and restraightening, in addition to the resulting production slowdown and a loss in incentive pay for the straightener who had originally worked on them.

Lighting Solution

It was at this point that the company's industrial engineers were called in to attempt to overcome some of these problems. The solution appeared to be in two parts: (1) to provide a better rail for the straightener to work on, i.e., one that had a uniform sweep or curvature with a minimum of hooks or bends and (2) to improve the lighting.

The relighting was started at one of



Six 200-w RLM deep reflectors positioned around press were part of new lighting system

the six presses, which was manned by two of the more experienced men. It was believed that the solution might be in the use of just the opposite type unit to those they had been using, namely, a large-area, comparatively nondirectional source, such as the fluorescent 4-lamp, 40-w unit shown in one of the accompanying photographs. This unit was mounted in the place where the head lamp had been located.

The second step taken was to provide some general lighting around the machine area to cut the contrasts within the normal viewing angles. This was done by positioning six 200-w RLM deep reflectors around the press, three on each side and suspended on a trolley system so that the machine operator could adjust each light vertically as well as laterally for the best highlights and shadows on the rail for rapid detection of flaws.

The straighteners seemed to prefer the bluish light from the incandescent daylight lamp for best visibility along the steel rails; therefore, daylight lamps were installed in these RLM dome fixtures. It was found that lights directly over the rail were most unsatisfactory because of the direct glare and hot-spot problems that occurred.

The deep reflectors were chosen to eliminate the direct filament glare from the bulbs. Standard 40-w cool white fluorescent lamps were used in the experimental fluorescent fixture. Initially there developed considerable prejudice against the use of this fluorescent unit. It was felt that the low temperatures present in this open building during the winter months would cause unreliable starting. For this reason low-temperature lamps were used but it was soon found that these lamps could be replaced with standard lamps and operation was perfectly satisfactory even with ambients as low as 10 F. Some experimentation was done with fluorescent colors and the standard warm white was found to be slightly preferred by the men. However, the difference in preference was negligible.

All the straighteners agreed that the light was soft and glare-free, but they insisted there was not enough light, even though it was proved that there actually was more light than under the old system. In short, the new lighting was not accepted by the straighteners. However, the two men on the experimental machine agreed to give the system a two-week test. This press was originally one of the best lighted of the six presses.

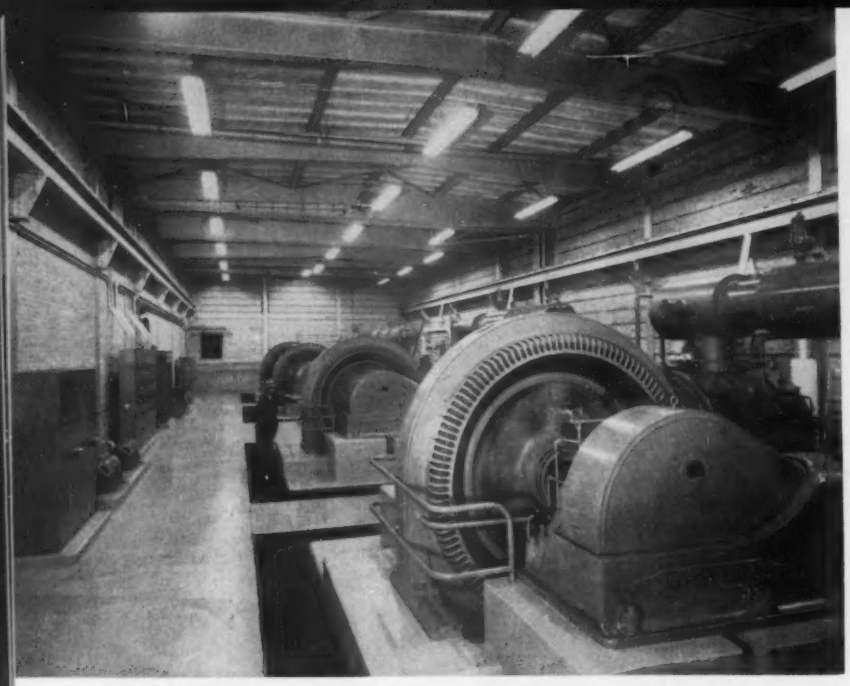
At the end of the test period a marked improvement had definitely been shown in the straightening done at this press. This resulted in the installation of the same lighting, on an experimental basis, on the poorest lighted press. The results were immediate and the new lighting was highly praised by the men on this press. As a result of these two jobs, all the other straighteners *demanded* that their presses be immediately relighted. This was done as illustrated.

Results of the program have been very gratifying. The new lighting plus the improved quality of the rails and the inauguration of a training program for the newer men have resulted in the reduction of unsatisfactory rails to 50% of what were previously rejected. This department is no longer a production bottleneck. The straighteners have materially increased their incomes and CF&I has made considerable savings.

Perhaps the most interesting phase of this job was not the actual technical solution, which merely follows along good illumination fundamentals, but the overcoming of the psychological problems and the satisfaction of solving a problem that has been of major importance in every rail mill.

CF&I and the power company worked jointly in solving the problem.

Old lighting consisted of 300-w headlight directed along rail into eyes of straightener

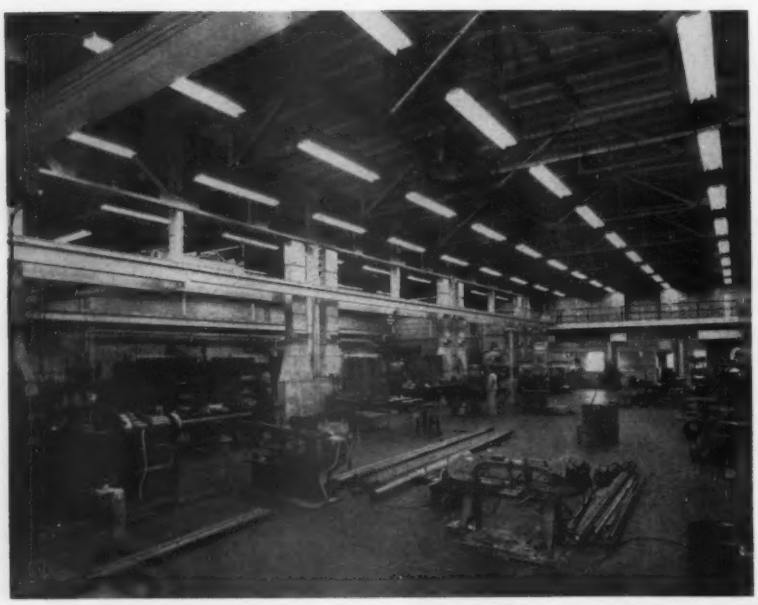


Lighting intensity does not vary more than 1 f-c wall to wall with high-bay fluorescent

Uniform intensity with

High-Bay Fluorescent

Wayne F. Mulcock, Utah Power & Light Co.
Salt Lake City



Average illumination in this machine shop is 36 f-c with essentially no reflected glare

• **Outstanding examples** of what can be accomplished in the way of good industrial plant lighting at high-bay mounting heights are shown in the accompanying photographs. The plant is a large industrial mining company served by Utah Power & Light Co.

The compressor room housing four 800-hp compressors is illuminated to 18 f-c. The lighting is so well distributed that the intensity anywhere, wall to wall, does not vary as much as 1 f-c. The room and machines are all painted a light color that reduces the contrast ratios throughout the room to within 3-to-1. Repairmen can work easily on nearly all parts of the machinery without the necessity of supplementary lighting.

Lighting fixtures are three-lamp, 8-ft industrial slimline fluorescent units operating on 430-ma ballasts and mounted 20 ft from the floor. Spacing between units is 9½ ft. This close spacing helps to explain the excellent distribution obtained. The total of 24 fixtures with a connected load of 7.2 kw operates nearly 24 hours a day at a cost of less than 7c per hour.

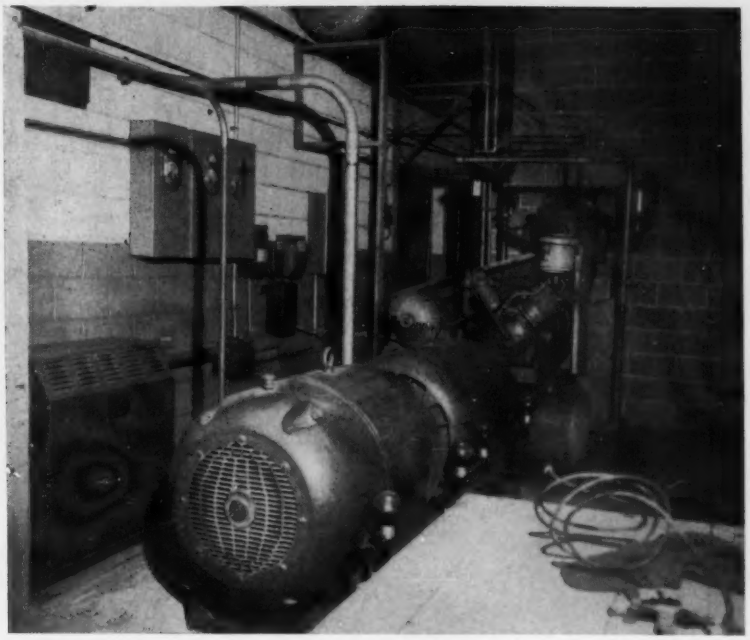
In the general machine shop area, similar three-lamp slimline fluorescent lighting fixtures mounted 20 ft above the floor are used. Average foot-candle illumination is 36, with a minimum level of 33. Here again the outstanding feature of the lighting system is the even distribution of light over the entire shop area. Equally important in any industrial lighting job is the elimination of reflected glare from machinery and tools.

In this machine shop the larger light source of the fluorescent fixture and the relatively high mounting height has essentially eliminated any reflected glare. The lighting level is also high enough to permit workmen to operate on any machine or piece of equipment without supplementary lighting. The exception is the higher levels required at the cutting point on the lathes. This would be true of all lathe operations where the point of cut should be in excess of 100 f-c.

In this machine shop there are 63 8-ft, three-lamp fluorescent fixtures with an average spacing of 7½ ft between rows. Total wattage is 18.9 kw. Long hours of operation made fluorescent fixtures here a wise choice.

Maintenance work on the fixtures can be performed readily and easily by a man standing on top of a traveling crane that moves freely under the fixtures.

The well-lighted shop has greatly improved the housekeeping habits of the workmen as contrasted to what they were under lower-level lighting conditions that existed before this shop was constructed.



High-frequency (3,000 cycle) generator for induction furnace is driven by 150-hp motor

Optical pyrometer used for precise control

White Collar Foundry

Sometimes it is interesting to get a report on an electric heating application that has been publicized after several years' operation. Use of electric furnaces for baking the investment molds in the plant of Precision Castparts Co., Portland, was described by Don Kearton, Portland General Electric Co. in ELECTRICAL WEST in October 1953, p 91. Absence of the products of combustion enabled keeping the foundry of this concern so clean that it was called the "white collar foundry."

The initial installation consisted of six electric ovens for mold curing and two induction melting furnaces. Accurate temperature control made possible by electric ovens and furnaces was the key factor in Precision's original decision to use electrical equipment.

Kearton now reports that this same company, confronted with the necessity of increasing production, was so pleased with the initial installation that it has now added a 100-kw, 3,000-cycle induction generator for high-frequency heating. This will have three stations so that melts of 25, 50 and 100 lb can be made.

When the manufacturer was confronted with the problem of increasing production, the factors that influenced decision to add more high-frequency heating for making investment casting were: excellence of performance of existing HF heating eqiupment; cleanliness; close temperature and metallurgical control; and employee comfort in the work area.

Since the first article referred to was written, the company's business has grown tremendously, requiring an increase in floor space from 10,000 sq ft to its present new building with 42,000 sq ft and employing 150 workers.

Serving Separate Premises

It is not uncommon for utilities to receive customers' requests to serve separate premises through one meter. Many utilities permit a one-meter service where a street or alley separate the premises, such as an automobile sales lot with garage across the street or the common case of a food market with parking space across an alley. However, some utilities require separate services and meters, and will not combine consumption.

A simple and well phrased rule covering this kind of situation is that of the Sacramento Municipal Utility District. It reads in part:

"District will serve separate premises directly and will not supply energy to more than one premises through the same metering installation except as provided herein. As used herein, the term 'premises' means all land, buildings or portions thereof occupied or apparatus operated by an individual person, family or business enterprise and situated on an integral parcel of land undivided by public highways, streets or railways.

"A customer who requires electric service at more than one premises may obtain a supply of energy at a single point of delivery if (a) such premises are contiguous or would be contiguous except for separation only by a street, railway, highway or combination thereof and (b) such customer provides and maintains the necessary electrical facilities between the district's point of delivery and his electrical apparatus in accordance with the applicable statutes, ordinances or regulations of the governmental agencies having jurisdiction thereof, and in such a manner that the convenience of the district and the safety of its personnel are not adversely affected."

Infrared oven solved moisture problem in plywood and permitted assembly-line production

Moisture problem is

Solved by Infrared

With electric heating and a Wood Welder four men produce 30 custom-built tables daily

Moisture is removed from Plywood in a two-minute Pass through 8-kw oven

Installation of an electric oven fitted with eight 1,000-w tube-type infrared heaters and built-in conveyor, solved two critical problems of Ken Kraft Inc., a manufacturer of custom-built tables at Port Townsend, Wash. This is a customer of the Puget Sound Power & Light Co., and solution of the problems is credited to Puget's commercial representative, Don Wirt.

The infrared oven corrected a nettling moisture problem and at the same time permitted assembly-line application of lacquer finishes.

The moisture problem was unusual. The tables feature finishes in ten colors —wheat, silver fox, fawn, cordovan, copper, walnut, mahogany, platinum, emerald and Salem maple—made distinctive as applied to the deep-wild grain of Japanese senwood (ash), which comes as plywood by ship to this seaboard town, Port Townsend. The plywood absorbs atmospheric moisture that cannot be removed by storage at ordinary room temperature. Troubles with the lacquered finishes showed up in a shipment of tables to Alaska, when the finish was ruined by the moisture freezing under the surface. The infrared heat successfully removes the moisture from the plywood, by a two-minute pass. It is successful particularly since it need only penetrate to the first glue-line of the 1/16 in. thickness of veneer.

The use of this 8-kw oven plus a small high-frequency Wood Welder for gluing parquet and herringbone designs gives this small shop high-speed production methods for truly high quality furniture making. The Wood Welder gives 10-second drying for glue and the infrared oven permits sequence application of filler, stain and lacquers in rapid succession. Each piece receives the complete finish before it is sent along for assemblying.

Successful applications require only two minutes to pass through the oven as compared with two to four hours of drying at room temperature. Speeding up this process has done away with need for placing parts in racks between finishes, has reduced labor of handling and storing which also invited damages to surfaces, and moreover released much space for other production use.

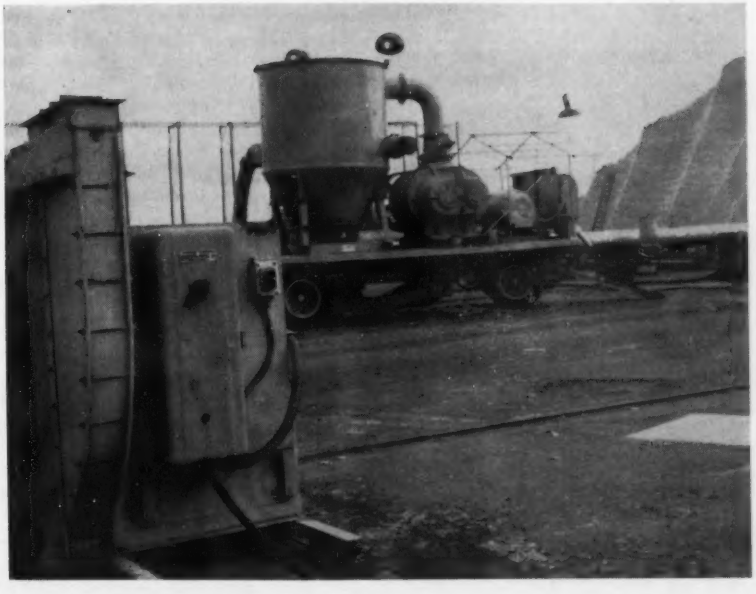
With the speeded up methods, orders for custom-built tables are filled daily in assembly-line fashion at the rate of 30 tables a day for a nominal crew of only four people.

T-shaped gantry crane is used to pile cottonseed in storage area. Seed is raised by bucket elevators to the horizontal belt conveyor

Mass handling is solved by

Portable Cottonseed Blowers

Dick Williams, Arizona Public Service Co., Phoenix



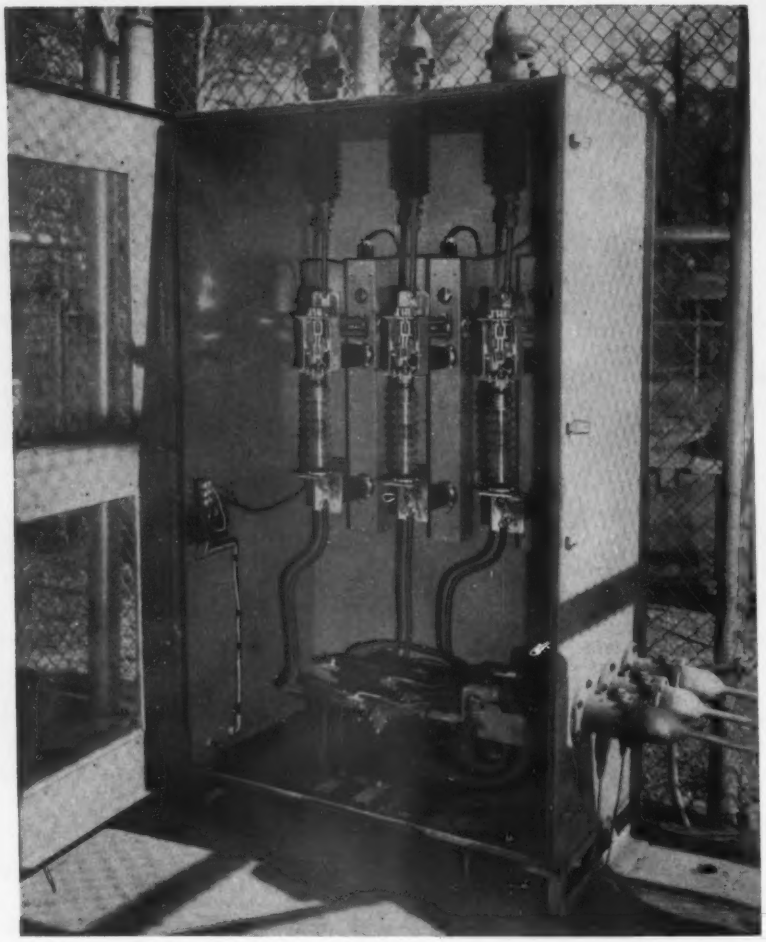
Pneumatic system using portable blowers conveys cottonseed from bulk storage to mill

Portable blowers proved the most economical solution for Producers Cotton Oil Co. of Phoenix in moving cottonseed from a large outside storage pile to the mill where cottonseed oil is made. A pneumatic system blows seed into a pipe-line network and conveys it through a combination of fixed and flexible pipe lines to the plant. The mobile blowers, as shown, handle up to 20 tons per hour with a 125-hp motor.

The total operation requires nearly 30 acres of seed storage and mill space. Most of this area is used for seed storage. In some cases the distance from pile to mill is 1,500 ft.

The T-shaped gantry crane shown is used to pile the seed in the storage area. This crane moves on rails as the seed pile reaches maximum height. Seed is raised to the top of the crane by bucket elevators and moved horizontally in either direction by belt.

Power receptacles are conveniently located in the storage area for the portable blowers and conveyors. These centers have 100- and 200-amp outlets.



Vacuum switch in 12-kv primary of transformer bank serves as electric furnace control

Steel mill has

Vacuum Switch Control

First heavy-duty industrial application of vacuum switches, other than in the plant of Jennings Radio Mfg. Co., San Jose, Calif., manufacturer of vacuum switches, is to be found in the steel mill of the Western Rolling Mills Inc., San Jose. Here there are two important applications for which Jennings develped special equipment.

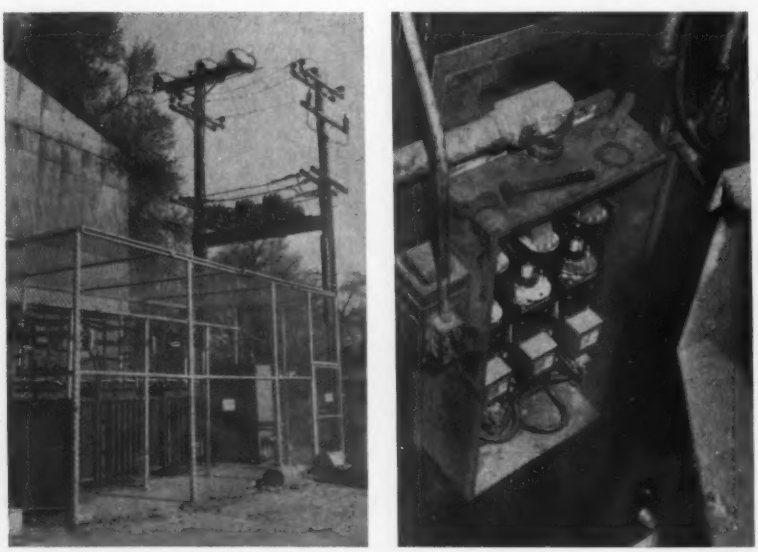
One switch is in the 12-kv primary of a bank of three 500-kva transformers feeding a 1½-ton electric furnace. The vacuum switch shown is the only switching or overload device between the primary of the transformer bank and the pole-mounted fuses of the Pacific Gas and Electric Co., the serving utility.

The vacuum switch, rated 200 amp, is trip-free and is used to start and shut down the furnace as well as for overload protection for the occasions when the furnace load becomes abnormal. This may happen as many as 8 to 10 times a day. The vacuum switch is set to relay out at 200% load on the transformer bank. Fault duty on the vacuum switch is heavy since the customer is served from an important 12-kv tie line between two nearby substations.

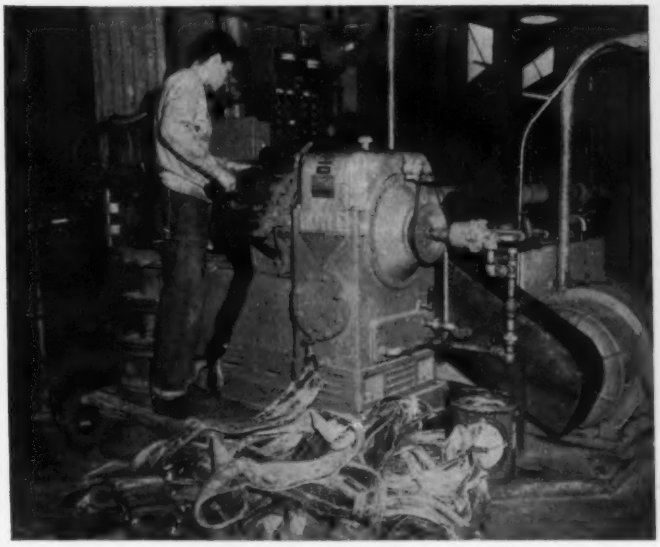
The other vacuum switch is used to control a 150-hp, 480-v line-start rolling mill motor. This switch, also illustrated, is rated at 400 amp. The motor is started and stopped some 15 times a day and the vacuum switch serves as the switching and protective device to handle the starting current of 800 to 1,000 amp and to break the full load motor current of 162 amp.

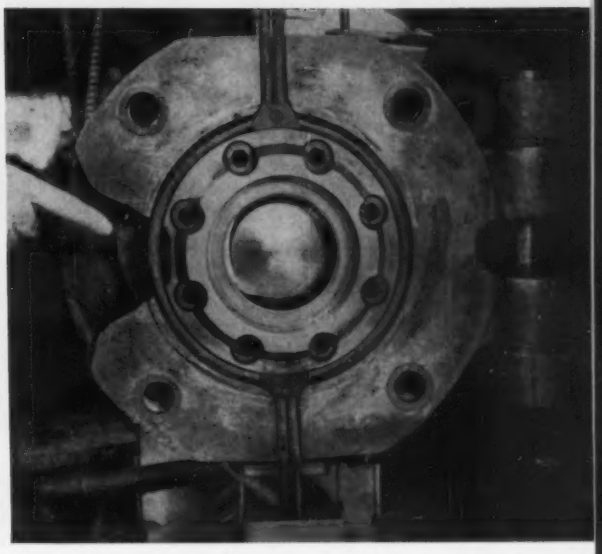
Both switches have been in service for more than six months and management of the steel mill reports entirely satisfactory service. Advantages of the vacuum switches are first cost saving, no maintenance, small space required and half-cycle interruption.

For information on the vacuum switch and its applications, see ELECTRICAL WEST for July 1955, p 72; August 1955, p 78; and December 1955, p 65; and American Institute of Electrical Engineers paper No. 56-225.



Vacuum switch in enclosure at left displaces OCB. Right: Vacuum switch on 150-hp motor





Neoprene is fed into extrusion machine (left). Right: Extrusion machine. Heating element indicated by finger maintains temperature

Close temperature control

Dictated Electric Heat

Lewis B. Reed

Industrial Heating Consultant
Los Angeles Department of Water & Power

The General Cable Corp. is enthusiastic about its new neoprene weatherproof insulating compound, and is positive the electrical industry will find it to have many advantages for weatherproofing applications. At the Los Angeles plant, engineers give the use of electric heat full credit for making it possible to extrude an even coating of the new compound on line wire, and thus provide an improved weatherproof line wire with smooth and seamless insulation of small over-all diameter.

To extrude the compound as a wire covering, it is forced through a screen and into the extrusion die by a screw, in the same manner as meat is forced through a meat grinder. During its travel through the screw, the temperature of the compound is critical and must be kept constant to insure uniform pliability to form an even thickness around the wire.

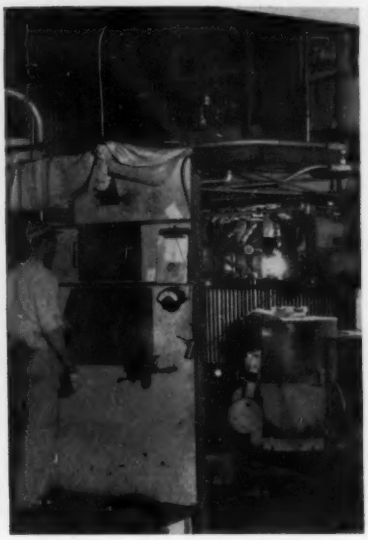
The first presses were heated with steam jackets but the use of steam apparently did not fulfill the exacting temperature requirements. Steam-jacketed heating is conducive to even heat distribution but, because of the large mass, temperature is difficult to control if extra heat is produced by other sources. In this case added heat was produced by the pressure of the screw on the neoprene.

Installation of electric heating units reduced the size of the mass and, by the use of a water spray, overriding was curtailed. No difficulty was encountered in installing the units, and the design of the pressure chamber made it possible for them to be used very efficiently (see photograph showing end of extrusion chamber with die head swung out of working position).

Uniform temperature is now maintained by use of 32 800-w heating units and three water sprays electrically operated by solenoids. The 30-in. section in which the compound passes before reaching the extrusion die is divided into three zones, each zone separately controlled by a thermostat. Temperature of each zone is maintained (temperature depending on size of wire being covered and thickness of covering) by use of the electric heating units when the temperature tends to drop below the low control point, and by water spray evaporative cooling when the temperature tends to rise above the high control point. The difference between the two control points is very minute and cycling is partially controlled by operating the heating units on full or half voltage, and varying the heating and cooling periods by use of a proportional time control.

General Cable Corp. tests indicate serviceability of the insulation is retained under extremes of cold and heat. At subzero temperatures the material stays pliable enough for emergency line work without any risk of cracking through brittleness—even when the wire is twisted around itself on the shortest radius bend. It is totally immune to the normally destructive influence of the ultraviolet rays of a tropical sun, does not become tacky—no matter how hot the sun's rays. Test samples over 10 years old have been tied in knots and the strained surfaces have shown no deterioration of the compound. It will not absorb water under any condition, and is oil and flame resistant. As it does not deteriorate, it will not festoon. Service life is reckoned in decades instead of years.

"Tip-Top," the name the General Cable Corp. has given its new weatherproof wire, is now being produced at the company's plant in Los Angeles, in sizes 14 to 1/0 for Pacific Coast use.



Resistance furnace automatically makes direct castings of tungsten carbide; 6,100° operating temperature is reached in 45 seconds

Resistance furnace proves best for

Making Tungsten Carbide

F. J. Stewart, Power Consultant, Southern California Edison Co.

Consistent with its record as a leading manufacturer of welding apparatus in the San Francisco and Los Angeles areas for the past 40 years, the Victor Equipment Co. has recently installed an electric furnace in its Norwalk, Calif., plant that has greatly advanced the production and use of tungsten carbide. Manufactured by the Component Parts Co. of Whittier, Calif., under the direction of Ralph Abos, the three-phase resistance furnace automatically makes direct castings of the extremely hard alloy which is formed at a temperature in excess of 6,100 F in two to four minutes.

This high-quality alloy is used extensively to harden the surface of steel tools in industry, agriculture and oil-well drilling. Without its application, many present-day operations would be utterly impractical.

Operation

The charge is loaded in each of three hollow cylindrical graphite (carbon) crucibles. After loading, the crucibles are raised by hydraulic lift and locked together with their open ends nesting tightly. Three-phase power is introduced at the base of each crucible by large graphite electrodes. By resistance heating the crucibles are raised to the melting point of tungsten, subsequently forming tungsten carbide. The casting machine at the center of the furnace is raised and the mold it contains is started rotating; crucibles are released from the large conductors and their contents are poured into the centrifugal mold inside the casting machine.

The crucibles are then cooled by water bath quench while the tungsten carbide solidifies in the graphite mold inside the casting machine.

Advantages

The revolutionary push-button remote control features of the furnace allow the blending of the carbon and tungsten and direct casting to shape by one operator. The time-consuming pressing and sintering of the tungsten carbide in powdered form is eliminated. According to J. R. Spence, vice-president of the Victor Equipment Co., this accurate control permits the production of a consistently high quality alloy, thus eliminating costly material reject.

Production rate of the furnace has been found to be 300% greater than that of an arc furnace. Because of its speed and accurate control, the new furnace offers other advantages. Because of its extremely rapid temperature rise, it reaches operating temperature in 45 seconds from a "standing start," and thereby a highly efficient use of power results. The operator of the furnace enjoys greater comfort because of cooler working conditions.

Characteristics

The installation is served from Southern California Edison Co. facilities at 480 v, three phase. Power is utilized by the application of a specially designed three-phase, delta-connected, 880-kva transformer with a 480-v, three-phase primary and a secondary range of from 8 to 64 v.

From tests made by the Victor Equipment Co., the demands created vary from approximately 400 kva near the start of a cycle to approximately 825 kva during the final 15 seconds.

Here is information on

Higher Utilization Voltage

Safeway Stores makes trial installation of 277/480 v

To gain experience in stores with the newer 277/480-v distribution utilization system which is becoming more widely used in commercial and industrial installations, Safeway Stores decided to make a trial installation of this system in one of its new stores in Portland. Because of being an initial installation in a food market, there were many problems that would not be encountered on a second job. Therefore, the full economy (usually about 20%) of the 277/480-v system over 120/208-v, four-wire, three-phase or 120/240-v single-phase lighting and 240-v three-phase power was not realized.

One of the problems not fully anticipated when it was decided to make this pioneer installation was the difficulty experienced in obtaining equipment from manufacturers rated at 277 v or 480 v, even for many of the large number of motors used, to say nothing of such important things as a 5-kw water heater, 2,260-w defrosting heaters used on refrigerated food cases, neon sign transformers, hot plates, etc.

The result was that out of a total connected load of approximately 250 kva, of which 100 hp is in three-phase motors, it was necessary to install one 25-kva and one 50-kva 480/120-208-v Y, dry-type autotransformers to serve 73 kw of load that could not be served either at 277 v or 480 v.

It is felt that this is entirely too large a proportion of the total load to have to serve either at 120/240-v delta, or 120/208-v three phase.

Moreover, there were three other factors which it will be necessary for Safeway to study before making a second installation. Many utilities will not supply the higher voltage service unless the customer purchases his own transformers or they will only supply 480-v delta and the customer must put in his own grounding bank to obtain the 277/480-v Y system. The second problem is one of maintenance. Motors in the smaller sizes rated 440 v are not nearly as readily available as are the more conventional 220-v motors. A third problem is the confusion in transferring over from temporary construction power supplied at the lower voltages to the 277/480-v permanent system.

Although savings in wiring costs were not appreciable on the Portland store, Safeway, who has pioneered in research on proper types of lighting, store design and layout, and equipment and merchandising practices for chain food stores, feels that it has gained valuable experience from the trial installation of the 277/480-v wiring system.

Sacramento Sets Policy

The Sacramento, Calif., Municipal Utility District has served loads in the past at 277/480 v that have been as much as 300 kva or over. This does not mean, however, that smaller loads will not be served at this voltage. No requests have been received to serve smaller loads.

Mason Sperry, the district's industrial power engineer, has the following to say concerning policy on this higher voltage: "Although the rules and regulations committee has considered certain aspects of 277/480-v service, as yet a definite policy has not been determined to handle requests for loads less than 300 kva."

Three-phase unit-type transformers have been ordered with 277/480-v secondaries as a standard for some time, even though they were to serve 480-v, three-wire, three-phase loads. To allow a stand-by unit, a 22x12, 277/480-v, three-phase unit of 1,000 kva capacity has been purchased and will be held for emergency use.

In most instances where new loads are proposed, it has been the district's practice to advocate 277/480-v service provided the loads were of considerable size or the building was of large physical size. The district's engineering department does not object to loads as small as 50 kva being served at this voltage if consistent with SMUD rules.

In order to guarantee reliability for smaller 277/480-v loads that will be served by small three-phase transformers with star secondaries, it will probably be necessary to duplicate orders for new equipment, at least initially. As stocks of transformers build up and the number of customers with this service increases this will, of course, no longer be necessary.

How Ultrasonics Works

Ultrasonics, considered a laboratory curiosity a few years ago, now is being used by practically every major industry in the country, according to Robert L. Rod, president of Acoustics Associates Inc. Development of low-cost, high-frequency generators of sufficient power to satisfy the heavy production requirements of industry and new techniques of transducer manufacture has enabled the ultrasonic industry to make great headway. Ultrasonics is used in such areas as automotive, aeronautical, electronic, electrical, precision parts and metal products manufacturing, as well as chemical, food, plastics, paper and textile processing.

Acoustics Associates is now building the world's largest ultrasonic cleaning and degreasing system for the Atomic Energy Commission. Its operation is described as follows: high-frequency generators totaling 20 kw will supply power for energizing hundreds of above audible sound generating transducers needed to irradiate materials being processed en masse. The ultrasonic energy developed by these transducers will create explosive forces in the cleaning solution as a result of the collapse and formation of millions of entrapped vapor bubbles at a rate of many thousand times a second. These forces eliminate the surface tension binding soils and contaminants to various parts of the materials being processed. The scrubbing action of the ultrasonically agitated solution flushes impurities from the entire surface of the material being treated.*

Parts of critical importance to AEC will be microscopically cleaned in a fraction of the time required by conventional methods.

* Editor's note: This is the principle of the ultrasonic dishwasher that appliance manufacturers expect to market.

As a result of wire users' report to California Division of Industrial Safety

Wire Tables Will Stand

Retention in the California Electrical Safety Orders of the present current carrying capacity tables (same as the 1937 National Electric Code) was the principal recommendation of the wire and cable users committee in its final report. This industry-wide committee was appointed in 1953 by A. C. Blackman, chief of the Division of Industrial Safety of the Department of Industrial Relations of the State of California. Its assignment was to gather field data on the experience and operation of 600-v wires and cables.

As a result of the report, Blackman states that the findings of the committee substantiate the position of the division in retaining its Safety Orders the present current capacity tables. At the same time, he pointed out that the California Electrical Safety Orders are subject to review at any time in the light of new developments. In fact, the division welcomes as much field data as are available in developing its regulations. Blackman takes the position that it is unrealistic to attempt to enforce any safety order that is indefensible in the light of field experience.

Analysis of 274 sets of survey data from all sections of the state was made. Field data were taken on the most heavily loaded circuits and under the highest ambients found for all major types of California industry. Industries included were aircraft, steel, metal trades, gas and petroleum, food processing and public buildings.

Neither the analysis of the data nor the records of the Industrial Safety Division for many years brought to light any failures from current loading. In the evaluation of the committee's observations based on the extensive field survey, the committee made the following recommendations:

1. That the present current carrying capacity tables in the Electrical Safety Orders be retained.

2. That some restrictions or prohibitions be formulated to govern the reuse or reinstallation of 600-v wires and cables that have been withdrawn from ducts or conduits.

3. That consideration be given to further study on the several topics mentioned in the appendix to the report, including heating in large fuse enclosures, wiring space in overcurrent enclosures, safety switches, plastic wires and cables, conduit fittings. They are of the utmost importance and bear serious threats to safety.

Committee Recommendations

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Purpose of Survey

The following excerpts from Chairman Smedley's letter of Nov. 16, 1953, to committee members are pertinent.

"The National Electrical Code, Tables 1 and 2, Chap. 10 and the 10 notes which refer to them reduce the capacity of cables (increase cable and conduit size) as shown on the chart. (Chart is here reproduced—Editor.) Some lesser increase in cable size can be effected by the use of more costly 75° rubber but in any case larger or more costly cables are called for than are presently required by the Electrical Safety Orders. If this increased cost is necessary to assure safe operation, then its use could be justified. I am advised, however, that the records of cable failures compiled by the Division of Industrial Safety do not show a significant problem or a necessity from the standpoint of safety even though the higher ambient temperatures prevail in many of our industrial plants and in large areas of our state. Industry has therefore undertaken, through this committee, a field survey of the use of cables to determine whether or not the present tables in the Electrical Safety Orders should be revised.

"The laboratory test work has been done by the cable makers to show the effect of loading on the physical properties of rubber insulation, and on which the National Electrical Code is based, is not being questioned. These tests, however, do not establish a relationship between these physical effects on 600-v rubber insulation and an electrical cable failure in service. In fact, there is a possibility that cable failures may not be so closely related to current loading as has been assumed. Some failures may be inherent in any extruded materials. Some damage occurs during installation. Some overcurrent devices greatly overheat the attached cables and the failure of such devices may cause cable failure. Actual failure of cables often occurs when outside factors such as corroding agents and flooding are introduced. Thus many factors, one of which may be the loading, contribute to the failure. Your committee work will bring out the facts."

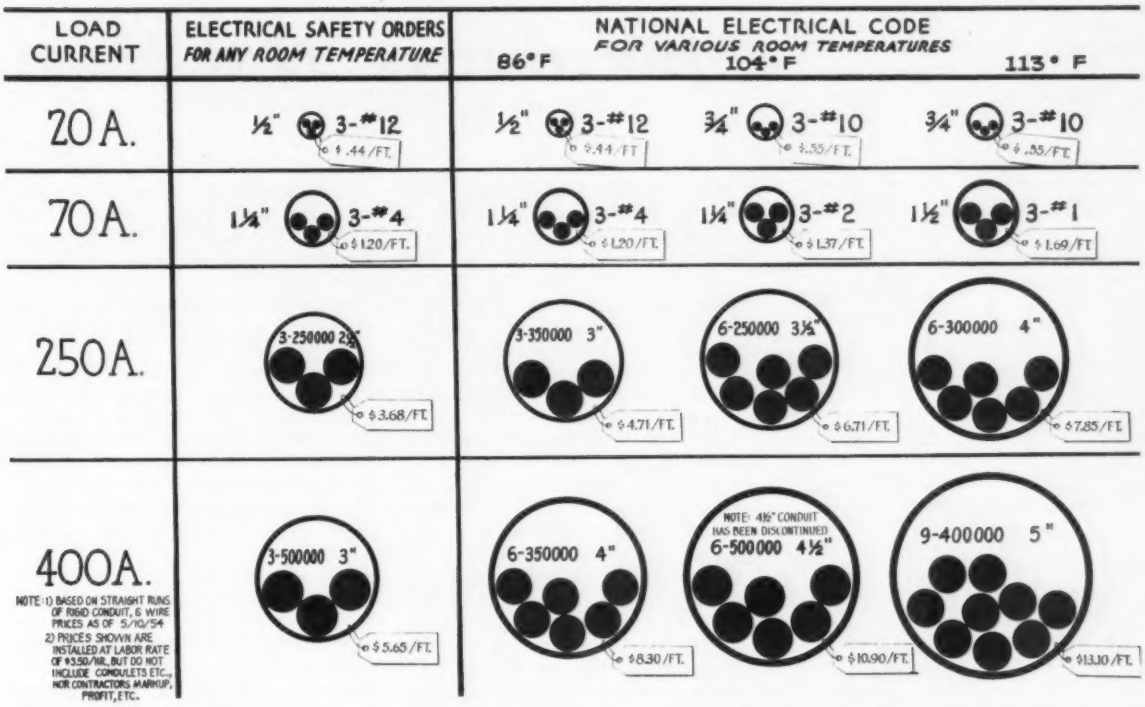
Committee Report

The following paragraphs represent the principal observations of the committee, which resulted from the study of 274 sets of survey data voluntarily collected in many and varied industrial plants and from records available from the Division of Industrial Safety:

Cable Operation—Many cables in important circuits have been reported still in operation after 20 to 30 years, with loadings near the maxmium allowed by the Electrical Safety Orders and without cause for concern as to electrical failure of the cables.

The few failures that have been reported indicate that the failures result from other factors such as inherent defects in extruded materials, damage during installations, overheating by overcurrent devices or failure of overcurrent devices to operate. Actual failures of such cables then occur when outside factors such as corrosive atmospheres, corrosive liquids, flooding and condensation are introduced to the

Comparison of Sizes—600-v Code Grade Rubber-Covered Cables


LOAD CURRENT
ELECTRICAL SAFETY ORDERS FOR ANY ROOM TEMPERATURE
NATIONAL ELECTRICAL CODE FOR VARIOUS ROOM TEMPERATURES
86° F
104° F
113° F
20 A.
½" 3-#12 ¢ $.44/FT.
½" 3-#12 ¢ $.44/FT.
¾" 3-#10 ¢ $.55/FT.
¾" 3-#10 ¢ $.55/FT.
70 A.
1¼" 3-#4 ¢ $1.20/FT.
1¼" 3-#4 ¢ $1.20/FT.
1¼" 3-#2 ¢ $1.37/FT.
1½" 3-#1 ¢ $1.69/FT.
250 A.
3-250000 2½" ¢ $3.68/FT.
3-350000 3" ¢ $4.71/FT.
6-250000 3½" ¢ $6.71/FT.
6-300000 4" ¢ $7.85/FT.
400 A.
NOTE: 1) BASED ON STRAIGHT RUNS OF RIGID CONDUIT, 6 WIRE PRICES AS OF 5/10/54
2) PRICES SHOWN ARE INSTALLED AT LABOR RATE OF $3.50/HR., BUT DO NOT INCLUDE CONDUITS ETC., NOR CONTRACTORS MARKUP, PROFIT, ETC.
3-500000 3" ¢ $5.65/FT.
6-350000 4" ¢ $8.30/FT.
NOTE: 4½" CONDUIT HAS BEEN DISCONTINUED
6-500000 4½" ¢ $10.90/FT.
9-400000 5" ¢ $13.10/FT.

This chart shows a comparison of wire sizes, conduit sizes and costs per foot based on the derating factors under various ambient conditions as required by the present National Electrical Code.

In the case of the 400-amp load, instead of placing nine conductors in a five-inch conduit an alternate method would be the use of multiple conduits in order to reduce the derating factor

other basic causes of cable failures.

There appears to be no relationship between the mechanical or physical deterioration of the rubber insulation and its electrical failure in 600-v cables. Many cables reported still in service after 20 years were made before modern antioxidants and other compound improvements had been developed. Mechanically these older insulations have deteriorated but still remain in satisfactory operation so long as the cables are not disturbed or moved. The newer and better compounds of more recent years should show an even better record.

Ambient Temperature — Complete records of ambient temperatures were reported on the data sheets. Other authoritative temperatures were obtained from the Weather Bureau. From the field, we learn that even in the coastal areas ambient temperatures often reach the 80 F to 100 F level, for significant periods, in the locations where cables and conduits are installed, such as under roof areas and exposure to sunlight. For industrial areas farther inland and in the valleys, ambient temperatures in the vicinity of the cable installations reach 100 F to 125 F with some as high as 140 F. In all these areas, code grade rubber insulated cables have been used successfully on the older installations with loads near the maximum allowed by the Electrical Safety Orders. No failures from current loading were reported or found after a study of all available records. Cable failures reported from other causes do not seem to bear any relationship either to the current loading or the ambient temperatures in the various areas throughout the state.

Safety—The Electrical Safety Orders and their enforcement have produced a safe and reliable industrial wiring practice throughout the state. Any reduced current carrying capacity tables together with further current carrying capacity reductions based upon ambient temperatures and numbers of cables in conduits would, if adopted and enforced, result in at least doubling the cost of most industrial wiring in the state and in some cases costs would be more than doubled. In view of the record of wires and cables in service, no added cost to industry could be justified from the standpoint of safety or from the standpoint of reliability.

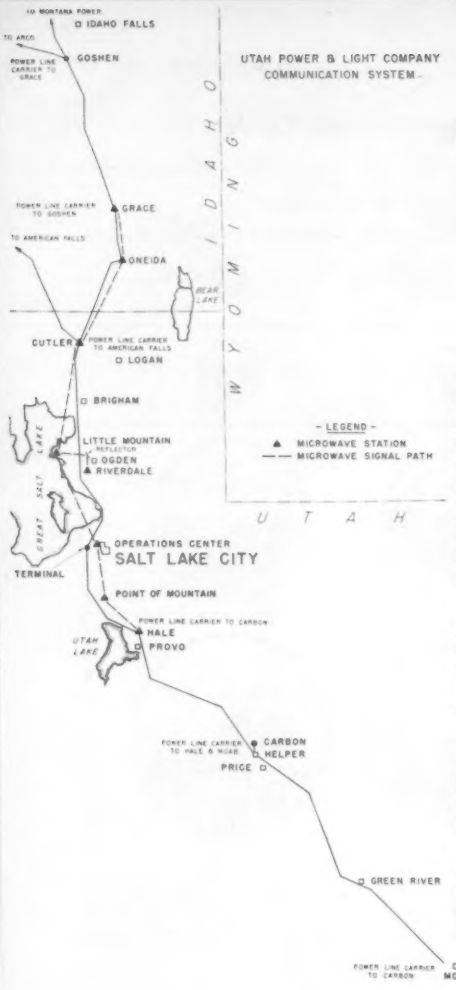
The report and text was adopted in its final form by the committee at its last regular meeting held Jan. 16, 1956, and was submitted to Blackman by its chairman, A. B. Smedley, consulting engineer of Pasadena.

Underground Center

The city of Portland, Ore., has started construction on an underground control center that will be the nerve center of the metropolitan area if or when a disaster occurs or an attack is made. This control center will be the focal point from which all rehabilitation and rescue work will be directed and will also be the seat of city government.

The $500,000 building will furnish space for departments of the city, fire, police, etc., that will be involved in rehabilitation work, and for other organizations such as the public utility companies, conelrad radio, Red Cross, CD organization and many others.

The building provides an entirely self-sufficient unit that will house 300 for seven days without any of them going out the door.



Cutler microwave repeater station (see map)

For backbone communication

Microwave Was Most

Need for additional communication channels and a revamping of existing facilities arose when Utah Power & Light Co. decided to install load-frequency control and move and modernize its dispatching center. A considerable number of circuits were required for telemetering intercompany tie lines, generation at all plants, and for raise-lower and fringe-control signals to the plants under control.

Moreover, additional voice circuits were needed for a new plant and for improving communication facilities with interconnected utilities for better coordination in operating load-control and load-scheduling facilities.

Consideration was given to using wire-line circuits, power-line carrier, microwave and common-carrier facilities. The company had two wire-line circuits through the section of the system where the highest circuit requirements were to be found. These wire lines were first constructed about 1910. Some reconstruction work has been done on the telephone lines but, in most cases, this reconstruction was done only to coordinate with construction of distribution circuits along the same right-of-way. This necessitated underbuilding the telephone line with the distribution power circuits.

The telephone lines were in need of considerable rebuilding to bring them to a standard considered suitable for telemetering service. This cost, along with the unreliability of open-wire telephone circuits, ruled out any further use of wire line than had been made in the past.

An analysis was made of the possibility of using power-line carrier to provide all channel requirements for telemetering and control as well as some extension of voice circuits. Three of the telemetering circuits to tie lines with connected companies would require transmission over 190 miles of transmission line through three bypasses. It was thought that one or possibly two repeaters in these circuits would be required. The Utah system is interconnected with two large neighboring utilities. Both of the interconnected companies have been using carrier very extensively. This created a problem in available carrier frequency space. It was determined that the facilities proposed could be provided but that future expansion by power-line carrier would be difficult. Common-carrier facilities were considered and a quotation was obtained from the telephone company covering all required facilities.

A study of the system was made for application of microwave equipment to provide the necessary communication circuits. The layout of the Utah Power system is ideal for microwave installation as it is long and narrow. The main generation and transmission facilities lie on an axis through the center of the system in the long direction. Arrangement of stations generally work in very well with the requirements.

Microwave for System Backbone

After carefully analyzing the means available to provide the communication requirements, it was found that by combining microwave, power-line carrier and wire-line facilities a workable system took shape. Microwave provided a central backbone system as shown where circuit requirements were the greatest. Power-line carrier was used to extend circuits beyond the microwave system where one voice circuit with telemetering or control was required. Existing wire lines were broken into short sections to extend the microwave circuits from repeaters and terminal to nearby offices and substations.

That portion of the communication system provided by microwave was arranged so that all repeaters would be used to drop out circuits. In all but one case the repeaters were near power company installations that required communication circuits. In the one exception, a three-way repeater was used to provide a path to a power plant on a leg circuit.

The microwave system was divided into two sections. These both terminate at the dispatcher's office in Salt Lake City. The North system extends from the dispatcher's office to a repeater at Little Mountain, repeating to Riverdale on one leg and Cutler on another leg. The Cutler repeater extends to Oneida and through Oneida to Grace.

The South system, starting at the dispatcher's office, extends through the Point of Mountain repeater to the Hale terminal. Many of the voice circuits are provided on a party-line basis.

Feasible

James S. Hooper

Communication Supervisor
Utah Power & Light Co.

The North system is now equipped with nine voice channels, one S-N control channel and four N-S telemetering channels. The South system is equipped with five voice channels, three S-N telemetering channels and six N-S control channels.

Operating frequencies of the microwave system are 1,855 mc and 1,895 mc. Frequency modulation is used with single side band suppressed carrier voice multiplex operating above 10 kc in the base band of the microwave system. Telemetering and control channels are carried on amplitude keyed or modulated tones operating between 3 kc and 10 kc in the base band of the microwave. Two types of tone channels are provided, one for the impulse channels operating into relays at each end of the channel and one for the 20-25 cycle continuous type telemetering operating directly from the demodulator and into the modulator without relays.

Many of the voice circuits on the microwave system are connected directly to wire-line circuits and telephone-line carrier circuits extending them to offices and substations between microwave repeaters. It has been possible to reduce the wire-line system previously in operation before the completion of the microwave by 70% approximately. This has greatly reduced communication maintenance on the system.

Power-line carrier was used to extend circuits beyond the microwave system where only one circuit was required and microwave could not be economically justified. Three such extensions have been made. In each case a full duplex system was used, providing continuous two-way communication. Superimposed on each circuit are high-frequency tones in the upper end of the voice band for necessary telemetering and control channels.

One example of extending the circuits from the microwave by power-line carrier was the extension of a circuit from Hale to Carbon to Moab. At Hale the voice channel was connected to the power-line carrier along with the fringe control and impulse control for the load-control system. Telemetering from Carbon received at Hale was also connected to the microwave at Hale. At Carbon the telemetering channel and control channels from the power-line carrier were connected to the load-control equipment. The voice circuit was extended to the telephone switchboard at Carbon as well as a power-line carrier circuit to Moab. An attempt has been made to keep each carrier circuit as short as reasonably possible, thereby attempting to maintain a high-quality circuit.

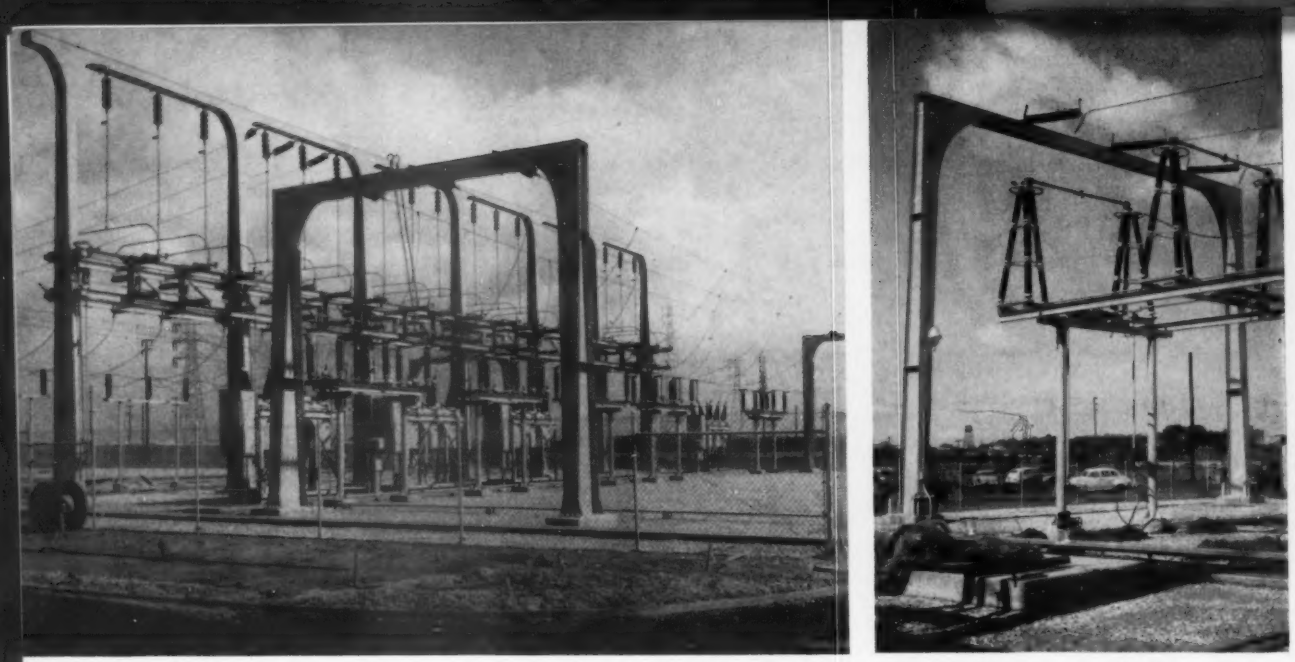
At the dispatcher's office all voice circuits were terminated in a telephone company 508A telephone switchboard. This switchboard has been provided by the Mountain States Telephone & Telegraph Co. and is its latest-type board for power dispatchers installations.

In addition to terminating all microwave circuits and cable circuits to nearby plants, five tie lines to the PBX dial exchange furnished by the telephone company are provided. This dial exchange is used in all of the power company's offices in the Salt Lake City area. This permits anyone on the power company exchange, by dialing the dispatcher, to be connected with any of the private circuits on the power company system, thereby providing good usage of the private system communication.

Plans have now been completed and equipment is on order to connect three microwave circuits to the PBX dial exchange so that direct dialing can be accomplished between the PBX and main offices outside of Salt Lake City on the Utah system.

The communications described are expandable to meet future needs.

Oneida repeater redirects microwave signal to Grace where power line carrier takes over



Stadium 66-kv switchrack and bus structure (left). Center: Alamitos 220-kv switchrack showing pipe structures and fabricated towers

Fresh approach to

Better Looking Substations

K. Fullenwider, Bechtel Corp., Power Division, Los Angeles*

To the casual observer a conventional outdoor substation does not usually present a praticularly pleasing outlook as a thing of beauty. Early in 1955, the Southern California Edison Co.'s engineering department requested the Bechtel Corp. to develop designs for switchyard and substation facilities associated with a new steam-generating station. Because of the plant location near residential areas, over-all appearance was to be a prime consideration. The problem, then, was to find a suitable design for rack structures that did not sacrifice eye appeal for the sake of electrical equipment with its confusing array of switches, bus work, insulators and hardware.

A fresh design approach was required that must somewhat ignore the electrical requirements of rack design to produce structures, which in themselves presented an architectural effect of good appearance as well as being functional. Much had already been done with Bechtel steam plant designs for transformer and take-off structures to make them compatible with architectural treatment of plant structures.

Structural requirements of large substations usually impose rather severe limitations when problems of line sag and tension, together with short-circuit capability, are considered. The basic problem, then, was elimination of all so-called lattice structures with the new structures being all of fabricated steel or rolled sections, yet with design which must not present a massive appearance or be uneconomic in weights or fabrication.

This new switchyard was to include 220-kv facilities for two 175-mw generating units, together with switching and protection facilities for two outgoing 220-kv transmission lines. Ultimate facilities provide for double tension bus, with generator and line positions equipped with circuit breakers to both buses.

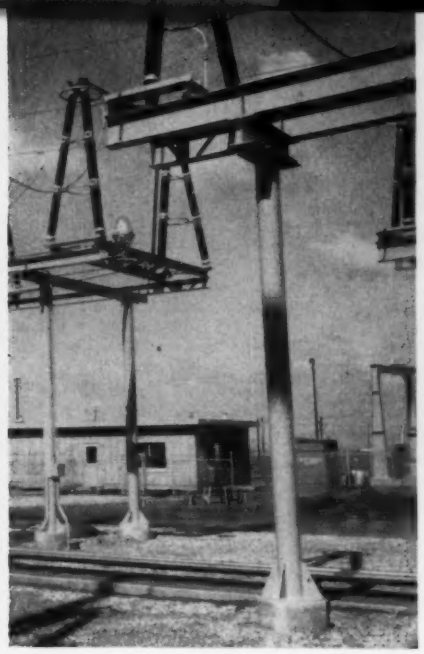
In addition to the 220-kv station a 66/11-kv distribution substation was to be built adjacent, with an ultimate capacity of 60,000 kva. Initial installation was to consist of two 66-kv lines and a 15,000-kva transformer bank with five 11-kv lines. A reserve 66-kv line was to be provided to the steam plant.

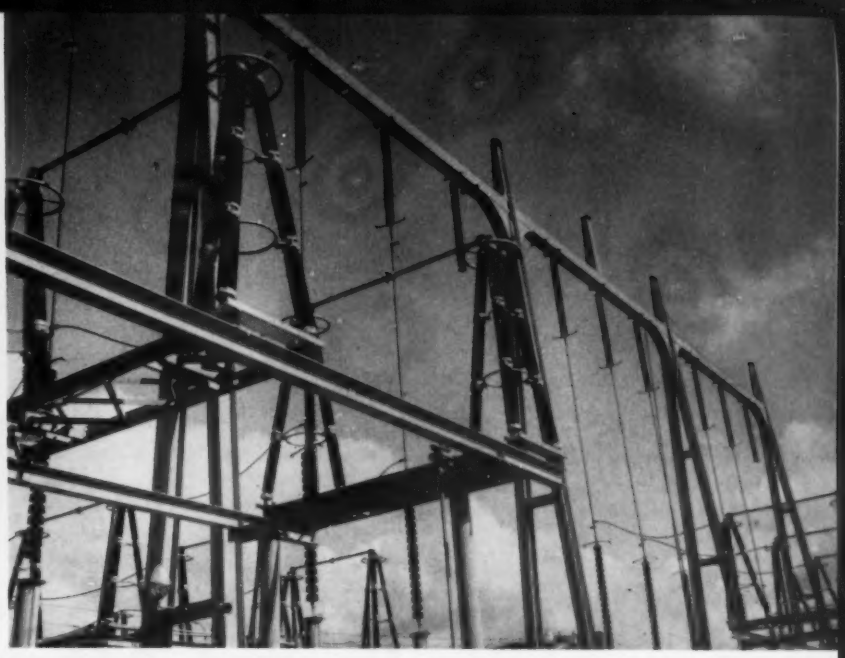
Designs were developed using Southern California Edison's standard station arrangement with tension-type 220- and 66-kv buses and horizontally mounted bus disconnects on separate support structures. Line dead-end structures are 60 and 40 ft for 220 and 66 kv. All rack structures are fabricated steel members, shop welded with bolted field connections. All large columns are tapered and curved for architectural effect.

Transformer and 11-kv rack structures were developed for elimination of cross brace members using wide flange rolled sections. All connection plates were designed for shop welding to structural members with field connections made with high tensile bolts. This resulted in a structure consisting of fewer than a dozen different structural members, as shown.

Considerable use was made of pipe structures for disconnect switch supports, line drop tie down columns and bus supports to carry out the uncluttered appearance of the complete sta-

* Taken from presentation made before the Engineering and Operating Section, Pacific Coast Electrical Assn., San Francisco, March 22-23.



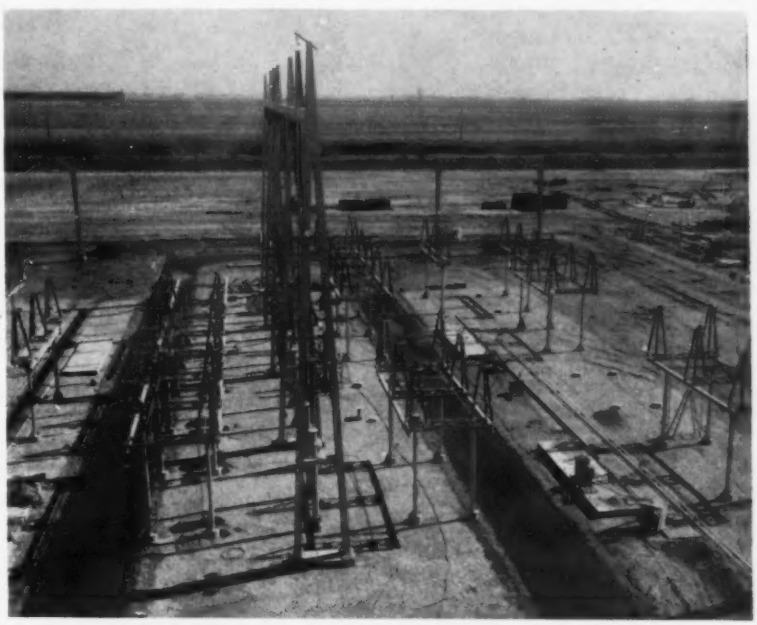


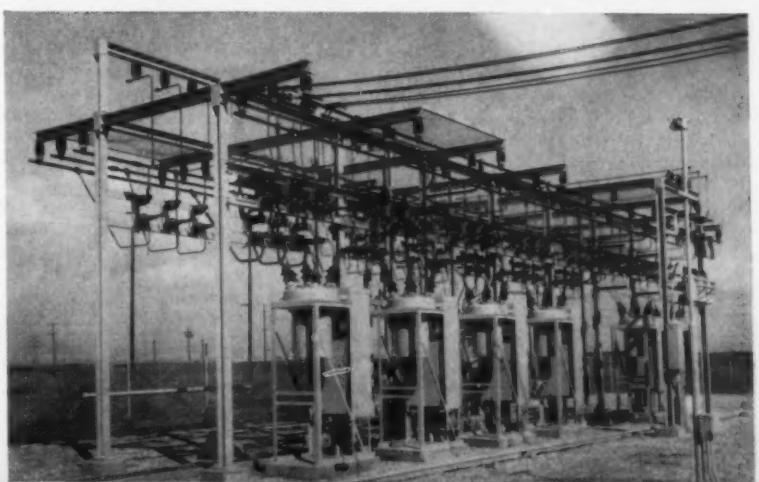
New Edison-Bechtel Alamitos 220-kv switchrack where eye appeal is combined wtih functional requirements of electrical equipment

tion. Studies were made to determine relative merits of galvanized vs painted structures. Over-all system requirements favor galvanizing over painting but, because of this station's proximity to beach area with corrosive atmosphere, painted structures were used. The painting schedule resulted in an over-all appearance that matched that of the adjacent steam plant structures. Certain modifications are required in these designs to facilitate galvanizing. These are primarily the use of splices to limit the size of structural members to galvanizing facilities.

Designs are now in progress for distribution-type substations of 4, 11 and 16 kv to permit standardization of rack structures for all of these voltages using a single design. Problems of equipment variations as to physical size and ratings have been worked out, which will enable this rack to serve all variations of station arrangement. Future equipment changes or extensions will be easily accommodated with access for change out or the addition of breakers, regulators or transformer banks.

Principal advantages of these new designs now appear to be: ease of design standardization for subsequent repetitive stations, fast and more economical steel erection together with probable saving in long-term maintenance. Probably of the most importance, the resulting improved over-all appearance to the public eye will be of considerable value to a large public utility.





General arrangement of Alamitos switchrack (upper) showing 220-kv disconnects and line dead-end structure. Below: 11-kv rack making use of wide flange structural members

Sinnott
San Diego G&E

Scott
Graybar

Peter
PG and E

Leihy
Electrical West

PCEA Engineering and Operating Section

Sets Record Attendance

All registration records for a meeting of the Engineering and Operating Section of the Pacific Coast Electrical Assn. were exceeded by more than 200 at this year's two-day conference held in San Francisco, March 22-23. *Total registration was 871!* This even exceeded the male registration for any past annual meeting of the association. The remarkable attendance indicates the intense interest in engineering and operating problems and shows the confidence management has in the value of these work conferences. The agenda for one meeting was so interesting that it drew an attendance of 185 in competition with seven parallel meetings.

The conference featured two luncheon meetings. C. W. Leihy, editor of ELECTRICAL WEST, an observer of European electrical engineering practices for several years, in addressing the first luncheon meeting said that European utility engineers, living with a chronic shortage of materials, land and natural resources, are necessarily leading the way in much experimentation that can be useful and profitable to utilities the world over. Prevailing shortage of fuels, he said, is behind the intense European interest in the development of nuclear power generation. He pointed out that atomic energy will be economically feasible there long before it is in the U. S. because of these extreme conditions. Other developments forced by economic conditions include: bundled conductors to save on cost of right-of-way and tower materials; underground generating stations to save on both land and materials; roof-to-roof residential distribution circuits; and higher transmission voltages with the standard set for 380 kv for international and intercompany interchange.

Growth of California in the 1956-1965 period was discussed by Harold Furst, regional economist, Bank of America, at the second luncheon. He said basic factors to be considered in analyzing future growth are population trends and incomes of various groups. In his optimism over the future of the state he sees only one cloud on the horizon—the tendency for the farmer to receive less for his production in proportion to other groups.

H. A. Lott, executive engineer, Southern California Edison, discussed the power situation in the Pacific Southwest. He said that rapid load growth of the area had necessitated a heavy generation construction program; that steam generation is now the most important phase of new developments; and, importantly, that all facilities to meet load growth had been built with nonfederal money.

Communications Group

R. L. Brinton, Sponsor

Subjects for discussion by the communications group were selected on the basis of current and general interest to engineers charged with the responsibility of installing, maintaining and operating communications equipment in the electric utility field. The two-day session provided time for discussion of seven subjects, all of which were well attended. The number of persons attending averaged between 35 and 55, which is a greater number than any previous sessions of this type.

T. R. Ferry of PG and E opened the meetings with a very interesting talk on "Technical Considerations in Planning Microwave Systems." This is an important aspect to the reliability obtained in operation of microwave over a given path. Ferry covered free-space propagation, effects of earth and characteristics of atmosphere on fading conditions, practical problems confronting the microwave engineer and problem paths, and how they can be solved. It was pointed out how this phase of microwave engineering was extremely important to the reliable operation of a system after installation. Questions and comments from the floor followed.

An interesting discussion on maintenance of large mobile radio systems by T. J. McMullin, Communications Engineering Co. of Dallas, Tex., was next on the program. McMullin stressed the importance of educating users and operators of equipment and pointed out that proper system design would minimize maintenance problems. In his experience, it was found that cumulative maintenance costs will equal investment costs in a large system in five to eight years. He covered at some length measures that could be taken to minimize maintenance costs on both base and mobile units. While much of this was routine to those present, it did cover a fresh viewpoint to the problem and was well received. In discussing the economics of converting existing equipment operating on 6-v d-c to 12-v operation, he stated that if the equipment was older than five years it was not economical. He stressed the shortage of engineers and techni-

cians, and suggested starting a program for developing technicians in the trade schools.

K. E. Dueker, Southern California Edison, spoke next on latest FCC rules governing carrier, VHF, radio and microwave. Pending rules and the status thereof are extremely important to utility users since certain decisions can be vital to their operations. Dueker commented on the status of docket 9288, which covers radiation. Certain parts of this docket have been defined: radiation from incidental devices must be controlled so as not to interfere with authorized radio services; and radiation from receivers in the 30-290-mc range shall be minimized by certification after May 1, 1956. Brinton remarked that this latter ruling should improve television and radio interference problems for the utilities. Dueker also commented on the fact that further conservation of frequencies by narrow band techniques were imminent. The use of microwave now requires that the user show the need therefor each year since it is considered a development service. Operational Fixed Microwave Council is endeavoring to obtain a "Classified Service" status for utility-operated microwave, which will change this yearly requirement.

A joint meeting with the systems operations group is reported under that heading.

R. L. Mayer, PG and E, and K. E. Dueker, Southern California Edison, jointly discussed carrier and microwave termination problems. Mayer outlined the problem with the aid of a prepared diagram that showed a "Universal Terminating Set" that would meet all requirements of users. This terminating set would be so arranged that many options could be obtained by strapping. It would provide magneto ringdown or E&M signaling, optional balance networks for hybrid balance, and isolating jacks of all branches of the hybrid as well as in the signaling "in" and "out" circuits. It was suggested that relays for signaling functions, jack field and hybrid should all be located on a separate assembly for this purpose. Dueker agreed generally with Mayer on all points and stated that there was a definite need for such a standard device that could be obtained from all suppliers of carrier and microwave equipment.

L. J. Abell, PG and E, gave a paper on methods for improving reliability of stand-by power systems, of particular interest to operators of radio equipment at remote locations. Advantages and disadvantages of the various types of combustion engines commonly used were discussed. He pointed out that stand-by generators using liquid petroleum gas as fuel have several advantages, particularly at high altitudes in remote locations. Cost of maintaining this type of engine is also considerably lower than gasoline or diesel-driven machines.

The closing session was a forum on "Trends in Microwave Equipment Design" presented by the following: Walter Sutter, G-E; William Dent, Westinghouse; Austin Olsen, Motorola; G. T. Tasto, Collins Radio; H. A. French, Federal Telecommunications Lab. These discussions were of general interest to all present. It was the generally expressed consensus that following World War II there was a tremendous need and demand for microwave in the utility field as a means of communication. As a result of experience gained in the postwar field, it has undergone a period of redesign and development. Many of the operational difficulties have been eliminated and today systems are available that will give 99.9% operational time providing they are properly installed.

Engineering Design

Karl M. Bausch, Sponsor

The program of this group was noteworthy for the emphasis placed on specific design details of system components. C. H. Zwiefel, Pacific Coast Engineering Co., told the group about a new "dual torque" crane control system that permits a flat load-speed curve and at the same time enables one hoist motor to perform both heavy and light load operations. The economy of that arrangement is coupled with a high degree of refinement of control, particularly in handling the heaviest loads incident to power house construction or maintenance requirements.

H. C. Austin, Southern California Edison, reported on a survey made on the subject of control room arrangements. There appeared to be little unanimity of opinion as regards either the physical size and arrangement of the control room, types of boards preferred or the size and grouping of instruments. Even lighting of the room seemed to vary with personal preferences.

Much thought is being given to the arrangements of individual control rooms and Austin presented a series of slides showing some of the more recent designs. He suggested that the use of mock-up control boards, incorporating the ideas of both engineers and operators, be built before designs are finalized. This has both morale and practical benefits.

In a joint meeting with the steam generating group, PG and E's C. E. Altman discussed the economics and reliability of the steam plant auxiliary power supply system. He pointed out that about 7% of total system generation was required as auxiliary power and urged that both designers and operators give increasing attention to effecting reductions in auxiliary power use. On the PG and E system this power cost amounts to several million dollars.

Altman also discussed various design variations for auxiliary power supply systems, including the grounded vs ungrounded type. The latter is used by PG and E as it eliminates instantaneous tripping in case of ground faults on the system.

This phase of system design was also discussed by W. D. Marsh, G-E, who commented in detail on the bus transfer of auxiliary supply systems.

Hydro Generation

D. P. Dinapoli, Sponsor

M. L. Dickinson, Bechtel Corp., discussing the factors influencing the choice between enclosed and outdoor types of construction for hydro plants made a cost comparison for a typical power house. For the example used, there is an advantage of $1.67 per kw, or about $133,600, in favor of the outdoor design for a two-unit power house having a rated capacity of 80,000 kw. If the number of units were increased to four, with a capacity of 160,000 kw, the advantage favoring the outdoor type of plant would increase to $2.06 per kw, with a total saving of about $329,000. However, he pointed out, a number of other factors must be considered in addition to the first cost.

H. R. Daniels, PG and E, described a method of cleaning hydrogenerators that costs 40% of previously used hand methods. Corn cob dust is applied at about 60 psi to surfaces to be cleaned. In this method the air must be filtered of moisture and journal housings and oil wells must be protected against the dust. J. H. Van Meter, also of PG and E, reviewed the maintenance problems associated with the wearing parts on both reaction and impulse-type machines.

H. B. Sherwood, PG and E, explored the problems of short brush life, unsatisfactory film and grooved commutators on hydrogenerator exciters. These problems are being cleared up, he stated, through the use of nonabrasive electrographitic grades of brushes, removal of brushes so that those remaining have a current density of 50-55 amp/sq in. during maximum load, and by shutting down one of several exciters serving a common bus. Sherwood added that use of nonabrasive electrographitic grade brushes has greatly improved collector ring operation in every instance.

A. Hastings, Southern California Edison, traced spot burning and high temperature of collector rings to contamination by oil. D. W. Fender and George Gunnoe, G-E, discussed the application of brushes to hydrogenerator exciters. Present policy of increasing current density in exciter design, along with careful selection of the exciter maximum rating, should overcome the current density problem. Fender added that one common mistake is to adjust brush wear initially to the correct value but to fail to maintain it as the brush wears.

W. J. Rheingans, Allis-Chalmers Mfg. Co., told of materials that hold promise for use in hydroelectric installations. T-1 steel for scroll cases has greater tensile strength and good welding qualities, except for the welding to dissimilar metal, which is being studied. Ampco bronze has possibilities for use in wearing parts of water wheels, subject to abrasion and cavitation. Modular iron may lend itself to advantageous use in parts of the turbines because it pours very well, has the machinability of steel and the strength of cast iron, and has suitable ductibility.

I. M. White, Pelton Water Wheel Division, B-L-H Corp., mentioned the definite trend in the type of impulse turbine from horizontal shaft to vertical shaft installation with from three to six multiple jets to one wheel. Pelton has now built nearly a million horsepower of multinozzle impulse turbines. White said that with three manufacturers active in the governor business a high quality product and continued research are assured.

In reviewing European impulse turbine practices P. B. Dawson Jr., Pelton Division, B-L-H, said that most turbines are of the horizontal shaft Pelton type because of heads up to 5,700 ft. Integral cast runners are standard construction in central Europe. He had visited a number of power plants and manufacturing plants during the summer of 1955.

Meter Group

R. E. Marshall, Sponsor

The first period of this group was given over to committee reports. J. L. Bartholomew, reporting for WUESSC, said meetings had resulted in: adoption of 480-v meter protectors by some companies; progressive abandonment of the automatic circuit closing device in meter sockets; development and introduction of a manual circuit closing device; adoption of standards for high-voltage outdoor instrument transformers and metering installations.

H. W. Welton, Southern California Edison, reported for the Pacific Utilities Electric Service Requirements Coordinating Committee. Major accomplishment during the year was completion of development of the PUESR "XG" heavy-duty safety socket box and its establishment in widespread use by member serving agencies. The box is for use in the 0- to 600-v service range. Its purpose is to take advantage of the increasing capacity of modern self-contained meters mounted on PUESRCC approved 200-amp heavy-duty meter sockets for metering low-voltage commercial loads in the 101- to 175-amp service capacity range.

E. W. Trenkle reported for the Arizona Section, PUESRCC. He said that service entrance sections are rapidly increasing in installations over 200 amp; that a new combination meter, main switches or meter, mains and circuit breaker panel, outdoor type, has been accepted by Arizona Public Service for residential single-phase and three-phase, four-wire delta services.

Trenkle also discussed metering of three-phase delta residential air conditioning loads. He said Arizona Public Service had 3,181 air conditioning customers with connected load of 13,797 hp. He said there are lengthy technical discussions regarding the accuracy of delta meters, but feels that his company is not justified in attempting to change its rate structure of selling energy under one meter for such a slight error, should one exist.

Kyle Stevens, Southern California Edison, discussed the advantages and disadvantages of the 2½-stator meter for three-phase, four-wire service. Advantages were given as initial low cost (approximately 72% of the cost of a three-stator meter, only two potential transformers are required on instrument transformer installations). Disadvantages are: voltage unbalance introduces errors; unbalanced loads with unbalanced power factor cause errors due to voltage on potential coils not being 120° displaced. Analysis of these factors indicates that the type of service to be metered must be one important basis for deciding whether 2½-stator or 3-stator metering is necessary.

Jack Prenderville, Southern Nevada Power, listed the following things to be considered in organizing a new meter department: a meter record system and its application; standardizing meter test procedures and methods; personnel and training programs; meter and meter parts, warehousing, stock control methods and systems; service requirement standards pertaining to metering and metering equipment; meter application policies and methods of metering to coincide with rate structures.

C. C. Raper, PG and E, discussed maintenance of demand meters. He pointed out that demand meter maintenance centers largely around trouble with registers. An unsatisfactory type of oil has been a principal problem. New types of oil and other lubricants have now largely eliminated this trouble. Best results have been had by replacing the gear cases on one type or the entire motor assembly on another type of register once every five or six years. Registers are then completely dismantled and cleaned. Cost of parts and labor is estimated at $5 for each register as compared with more than $30 for a new register.

J. L. Bartholomew, PG and E, gave an interesting account of meter damage in the northern California floods of last December. In the Yuba City area there were about 4,500 meters filled with water and varying amounts of silt. These meters were removed as rapidly as possible by five service crews. Meters were then thoroughly cleaned with hot water under low pressure, dried in an improvised electric oven, new jewels added, checked with a 500-v megger. Rate of salvage was inversely proportional to age of meter and period it was immersed. Less than 5% were burned out from shorting by flood waters. In other areas farther from a meter shop and subject to additional factors, such as contamination with sewage, salvage rate was much lower—only 50 out of 300 in one area.

Methods of training metermen and maintaining group interest in the job were subjects of discussion by Lloyd Greenhill, PG and E, and H. E. Naegeli, Southern California Edison. Greenhill presented a very comprehensive outline for a training program for metermen. Naegeli dealt with the human relations and psychological problems in maintaining group interest in the job.

W. D. Shattuck, PG and E, covered testing of varhour metering, starting with the need for power factor correction and covering testing of reactiformers or phase shift transformers, installation of varhour metering and testing of varhour installations. A complete outline of procedure and test methods were given.

Trenkle reported that a mobile meter test unit had increased production 30% for Arizona Public Service. A crew of three men has completed, on many days, 48 tests. The unit has proved so satisfactory a second one will be placed in service this year.

Burke Breedlove, San Diego G&E, said there are two philosophies in answering the question: "Are we too critical on wattmeter accuracies?" On one side is the thinking that it is worth the cost to adjust each new meter to close tolerances; on the other side is the thinking that even a small amount

Lott
Southern California Edison

Marshall
California Electric Power

Moody
General Electric

Reinbold
Arizona Public Service

saved per meter by not testing new meters, multiplied by the thousands of meters processed, is the basis for sound economics. Possibility of a new hermetically sealed meter was mentioned. From an accuracy standpoint, such a meter must have built-in accuracy, not only as received but also on a sustained field operational accuracy basis.

Naegeli said his company was using field performance of different makes of meters as a criterion for checking claims of meter salesmen. Sustained accuracy, life, longer bearing life, etc., can be evaluated in terms of actual experience. He asked the question: "Is a tool that looks at meters five to ten years old useful in establishing purchasing policy on new meters?"

The meeting concluded with representatives of Duncan, G-E, Sangamo and Westinghouse reporting on new developments by their respective companies.

Overhead T & D

T. A. Phillips, Sponsor

Before a group of 185, A. C. Schwager of the Schwager-Wood Corp., Portland, led off with a demonstration of the vacuum switch and described a number of tests and two permanent installations on high-voltage power applications. The vacuum switch, as made by Jennings Radio & Mfg. Co. of San Jose, Calif., consists of ⅜-in. tungsten electrodes within a glass tube 3 in. in diameter and 8 in. long, with a 1/10-in. contact separation a dielectric strength of 100,000-v rms is available.

Tests have included dropping 100 miles of 115-kv and 150 miles of 230-kv line without restrike. California Electric Power Co. has a permanent vacuum switch installation for opening loads up to 50,000 kw and dropping 97 miles of 138-kv line. Bonneville Power Administration has an installation switching two 5,000-kva banks of 115-kv capacitors back-to-back. Discussion by others familiar with this revolutionary new device indicated wide application at the present stage of development for switching high-voltage capacitor banks and for line dropping.

Insulator Contamination

A panel discussion in a joint meeting with the systems operations and substation groups brought out the practice of several utilities in combating the insulator contamination problem. On the panel were J. E. Conner and R. K. Klumb of Southern California Edison, J. H. Reeves, California Electric Power, E. M. Foster, San Diego G&E, and H. P. Braun, PG and E.

All reported the same growing problem, varying only in degree and the frequency of cleaning required. All use a high-pressure water stream directed by a special nozzle on a water gun operated by a lineman from a mechanical lift of some type. Practically all washing is done hot. California Electric Power is having success cleaning insulators in the vicinity of cement plants and at substations with powdered limestone blown by compressed air through a long plastic insulating tube. Others use high-pressure water at substations. All agreed that it was necessary to wipe insulators with rags on hot-line sticks before applying the water stream.

Although most reporting utilities have tried protective insulator coatings of various kinds, particularly silicone varnishes, little success was reported by any of them.

Mechanized Equipment

A joint meeting with the transportation group dealt with use of mechanized equipment in line work. Principal discussion had to do with tension stringing with the Pengo tension stringing machine built by the Petersen Engineering Co. of Santa Clara, Calif. Myron A. Kirsh, PG and E, reported that his company has several of the machines. Principal advantages cited were safety, speed and lower cost in stringing aluminum conductors over hot lines under current heavy traffic conditions. Savings up to 25% were reported.

P. C. Oldershaw, PG and E, said that some phases of line work have lagged behind industry in mechanism because of lack of suitable tools. He reported important savings through use of light line trucks, derricks that align poles so that piking is eliminated, shop-preassembled crossarms and aerial lifts from which to do line work. N. J. McKenzie, Southern California Edison, and R. A. Speer, California Electric Power, reported for their companies.

Series Capacitors

Use of series capacitors in the primary neutral of distribution transformers to improve voltage regulation and reduce flicker voltage was a new subject before the T & D group. N. R. Sheppard, G-E, discussed theory and L. J. Flanigan, California Electric Power, the economics of application. Despite the problems of large voltage rise from secondary faults and the possibility of ferro resonance, Sheppard said his company feels that series capacitors have a place in the distribution system.

Flanigan made an economic study of the case of a 25-kva transformer with 400 ft of 4-6-4 secondary each way with annual growth of 10% compounded, demand factor 85%, power factor 85%, uniformly distributed four-hour peak of 85% followed by an average load of 25%. Voltage regulation under these conditions would ex-

ceed the 5% ASA standard, he said.

Three proposals were studied to provide a life expectancy of seven years: proposal A, divide the secondary and install a second 25-kva transformer; proposal B, replace 25-kva transformer with a 37½ kva and change secondary to 2/0-2-2/0 ACSR after the second year; proposal C, install a 5% series capacitor and increasing secondary to 2/0-2-2/0 ACSR after the second year. Economics calculated on a present-worth basis showed $346 for proposal A, $276 for B and $145 for C. This showed a prospective saving of $201 or $141 respectively for the present worth for a seven-year service by installing the series capacitor.

Flanigan believes a realistic program would be to limit application to those cases where the secondary is undergoing a voltage drop in excess of the ASA standards.

R. E. Reinbold, Arizona Public Service, reported successful use of series capacitors to eliminate flicker from starting of air conditioning motors. Air conditioning and lighting are served from open-wye/open-delta transformer banks with neutral tap on the larger lighting transformer. To obtain reasonable balance between voltages on the three phases it has been found necessary to use a primary series capacitor on each of the transformers.

Conductor Size Economics

E. R. Sample, Southern California Edison, and M. P. Goudy, Arizona Public Service, reported economic studies on the economics of distribution conductor size. Both came up with similar results, i.e., that when losses and other factors are evaluated a utility is justified in using much larger conductors than in the past.

Sample's conclusions were based on loss savings alone, figured at three mills per kwh. Goudy included demand charges as well as energy in his calculations and came up with even greater justification for larger conductor.

A joint meeting with the underground T & D group dealt further with conductor economics. Russell Hulse, Arizona Public Service, showed that, on the basis of cost per three-phase circuit mile of line, No. 2 all-aluminum costs 33% less than comparable No. 4 copper; 3/0 AA, 30% less than 1/0 Cu; and 336.6 MCM, AA, 33% less than 4/0 Cu. Hulse discussed in some detail his company's problems and practices in its exclusive use of aluminum conductors.

R. C. Blankenburg, Southern California Edison, presented new mathematical formulas to help in orienting thinking and approach to determining the economy in use of aluminum conductors in underground cables. His equations show that we have been guilty of spending money in generating capacity to save in the cost of cable.

Fred Heller, Burndy Engineering Co., brought the group up to date on the connector problem. He indicated that through extensive basic research, laboratory work and field tests the aluminum connector problem has largely been solved. Both bolted and compression connectors are now available and give entirely satisfactory life and service when used with an oxidation inhibiter.

Steam Generation

J. B. Moore, Sponsor

In a discussion about laboratories and turbines of the future, N. L. Mochel of Westinghouse said present trends are to high temperatures and high pressures, as high as 1,200 F and 5,000 psi. But also in the immediate future are turbines designed to function with steam from atomic reactors. An important factor in this design work is to provide protection for working parts from effects of moisture corrosion and erosion. In brief, the future developments of turbines are strongly dependent on necessary new knowledge from the laboratories. His talk included descriptions of several new Westinghouse laboratories and the work that is being done in them.

It is not unlawful to emit an air contaminant under the California Air Pollution Control Act. This surprising information was presented by Robert Simpson Jr. of Southern California Edison's legal department. Based on his company's experiences in operating steam-electric generating stations within the area under the jurisdiction of the Los Angeles Air Pollution Control District, Simpson's talk revealed the need for solutions to the many problems of air pollution abatement. He said that, when air can be lawfully contaminated so long as the stack plume meets certain tests of opacity and grey color, it is obvious the problem needs to be taken out of the courtroom and placed in the research laboratory. His company is planning an expenditure of $1,750,000 for scientific research and for precipiton equipment for generating stations.

Observations of Allis-Chalmers Mfg. Co., with the aid of a transparent scale model pump intake structure, were reported by Arnold J. Thompson of Allis-Chalmers. He said the idea of a converging design for pump intakes is gaining ground. The trend would eliminate present bell-shaped intakes of vertical column type condenser circulating water pumps in steam plants.

E. P. Peabody, G-E, who is doing controls and instrumentation engineering for the Commonwealth Edison atomic powered station, described the dual-cycle, boiling water reactor that will go into the plant. In answer to a question from the floor, Peabody said: "The amount of fuel for one year's operation of this plant, by weight, is about equal to the amount of fuel operating an oil-fired plant for one hour."

When operating personnel willfully disregard well defined safety measures, no amount of safety equipment, interlocks or instrumentation will offset the hazard created by their attitude toward their work. This was the conclusion of H. T. Arfman, San Diego G&E, and S. F. Beuse, Southern California Edison. San Diego G&E had been forced to pick up the check for repair of two boilers because two firemen failed to follow clearly defined safety procedures. Cost was about $260,000 total, and the men were terminated after hearings. Emphasized was the importance of discovering potentially unsafe workers and correct or terminate them before they are given responsible positions.

Substation Group

W. S. Moody, Sponsor

Value of standards to operating people was the subject of a well thoughtout paper on a little discussed subject by J. H. Vivian, Southern California Edison. Vivian summarized this presentation as follows:

In the early days of the electrical industry, each installation consisted of a separate financial and engineering project, each having no relationship to any other. As we view our position of standardization today the question arises, "How have we come so far in such a short time?"

It has been accomplished by coordinated standardization of apparatus and equipment that has permitted interconnection of systems. Hundreds of standards are available to aid all people engaged in electrical work. Each standard represents many manhours of coordinated effort before final approval is given.

As standardization permits the majority of users to purchase the best product at the most reasonable cost, it behooves all of us to reply to questionnaires pertaining to this subject, in order that our recommendations are properly recorded and studied.

Fundamentally, standardization is valuable to operating people because it permits manufacturers, engineers, purchasers, operators and maintenance

men to speak the same language.

Oil Reclaiming Practices

Present practices in handling and reclaiming insulating oil were discussed by J. F. P. Williams, San Diego G&E, and J. L Buckley, PG and E. Williams discussed specific operating and maintenance problems, particularly his company's program of sampling and testing insulating oils. They have found it impractical to test oil in the field so send samples to the laboratory for test. From their tests and analysis of the problem, they feel that it is not economical to use reclaimed oil. They can sell old oil for 7c a gallon and their experience with reclaimed oil is that it has only 50% of the life of new oil.

On the other hand, Buckley said PG and E finds no sale for old oil and that by re-refining they can save 11c a gallon as compared with new oil. Moreover, re-refined oil is fully equal to new oil in all respects. PG and E has a routine field testing program for oil in transformers and oil circuit breakers. If oil shows high acidity or low dielectric strength, samples are sent to the company's laboratory for further testing.

Oil to be re-refined is shipped by the division to the central storage area. Here it is picked up by a commercial processor, re-refined and delivered back to the storage area at a cost of 8c/gal. This leaves PG and E a saving of 11c/gal compared with the cost of new oil. Under this program PG and E has refined an average of 500,000 gal of oil per year for the past three years.

Economical Size Substations

J. A. Smith, G-E, Schenectady, used a generalized study of overhead lines and distribution substations within a uniform 12-kv load area to illustrate the basic relations between load density, subtransmission voltage, substation size and over-all cost in determining the economical size for 12-kv distribution substations. Subtransmission at 69 kv and 138 kv was considered to supply areas of 1,000, 2,000 and 8,000 kva/sq mile.

With 6,000-kva loading per feeder the most economical sizes of substations fall in the general range of four feeders at 1,000 kva/sq mile, four to eight feeders at 2,000 kva/sq mile and eight to 12 feeders at 8,000 kva/sq mile. If feeder loading is limited to 3,000 kva per feeder, the most economical sizes are four feeders at 1,000 kva/sq mile and eight feeders at 2,000 kva/sq mile. Where a range of size is indicated above, the use of 69-kv subtransmission favors the use of the smaller substations; the 138 kv favors the larger substations. The study was presented as a guide to show the effect of subtransmission voltage and load density upon the most economical sizes of substations.

Reports of joint meetings in which the substation group participated will be found in reports for the following groups: system operations, overhead T & D, steam and hydro.

System Operations

J. H. Drake, Sponsor

The systems operations group offered excellent papers covering a variety of subjects ranging from personnel selection to high capacity field testing. The latter subject proved to be an unusually interesting presentation of Southern California Edison's recent experiences with the field testing of interrupting devices used on the system, by R. K. Klumb of that company. Edison has provided facilities to permit testing under actual system operating conditions with load currents equivalent to 150,000 kva at 4 kv, 500,000 kva at 12 kv and 1,500,000 kva at 69 kv. The paper pointed out that rapid system growth requires intelligent application of interrupting equipment and selection and production of interrupting equipment adequate for future operating requirements. The work thus far has demonstrated the need for proof-testing in the field under actual operating conditions. Motion pictures of several of the tests provided data and visual demonstration of the strength and weaknesses of various component parts of interrupting devices. Klumb urged that the industry use more full-scale tests as a means of pursuing a joint effort by users and manufacturers that will eventually lead to improvement in performance of these devices.

In a joint meeting with the communications group, the viewpoint of the system load dispatcher toward communication was presented by W. H. Smith, PG and E, and C. F. Frye, Southern California Edison. Smith, in his paper, traced the historical background of communications for dispatching and showed how the improvements in communication methods have improved both dispatching procedures and operating efficiency of the system as a whole. Microwave, teletype, telemetering and other new and important refinements in communications were discussed from the viewpoint of the dispatcher.

Frye outlined the requirements and functions of a communication system that includes the protection of service, restoration of service after trouble, the economical handling of generation, supervision of switching centers and the machinery through which reports and records are prepared. He pointed out that communication is the dispatcher's major tool and that no amount of automatic control can replace all of the personal judgment and orders necessary in operating a large system. He emphasized the importance of microwave communications in the

Dinapoli
PG and E

Bausch
Bechtel Corp.

Moore
Edison

Drake
Edison

Ramsden — Pacific Coast Engineering
Brinton — PG and E

operation of the Edison system. That company now has 78 channels and more than 5,400 channel miles, and uses microwave for communication, telemetering, supervisory control and may even use it for certain protective arrangements in the future.

Emergency procedures for operating personnel are necessary, especially where there are certain sequences of operations to be executed. F. M. Irish, Arizona Public Service, used the foregoing theme in his discussion of service restoration during emergencies. Although dispatchers are trained to do their own reasoning in handling all emergencies, Irish pointed out that procedures are necessary to help district and plant personnel when communication fails or when quick action is necessary. Experience has proved that a short procedure with a minimum number of steps, explanations and other requirements will stand a better chance of restoring service than a three- or four-page detailed manual on the emergency procedure. Intersystem emergency plans also should be worked out for major catastrophes such as earthquakes, floods or other calamity.

Ernest A. Gissel, chief load dispatcher of Arizona Public Service, told the meeting that there is a definite need for new methods of selecting men to become members of the operating staff of a utility. After selection, men must be given comprehensive instruction in all phases of protection schemes. They must have a thorough knowledge of generation, power transformers, current transformers, transmission lines and associated substation equipment capabilities so they can use this equipment to its fullest extent without damage. A man should complete a course in system communications and know how to utilize the capabilities of supervisory control and telemetering. Selection, education and training must be thorough if operating personnel is to think clearly and act correctly in emergencies.

The California Electric Power Co. recently raised its system transmission voltage from 90 to 115 kv. This change-over, described by J. G. Hart of that company, was predicated on economic and cost studies and was initiated three years ahead of time. A major factor in advancing the date was an over-all 7 to 10% saving in transformer costs for the Highgrove steam station, which was placed in service last year.

Planning for the conversion took 2½ months, the instructions being written out in detail and published for all personnel involved. More than 4,700 man-days of construction time were required to ready the system for the cutover.

A. R. Worthington, PG and E, presented an excellent discussion of the "Problems in Handling Maintenance and Operation of Load Frequency Control and Channels." The dispatcher expects the control system to operate properly 24 hours a day and to give him the means of controlling system frequency within close tolerance. Management expects the control of power flow between systems to be held at contract values. And with the investment in this automatic control equipment they expect, and rightly so, that fueling and system efficiency be improved.

To obtain a smooth, dependable operating system Worthington reviewed the following factors. In the design of a control system there should be close coordination of engineering and operating departments. In this connection, only the most dependable communications channels should be considered for the transmission of intelligence within the system.

Careful installation of the system will result in good performance, but like any mechanical-electrical equipment it will require a certain amount of maintenance. That problem can take on proportions. The greatest stumbling block in obtaining continued and dependable operation is developing properly trained personnel. The problem of finding and keeping capable personnel is a question that should be discussed thoroughly. Personnel to work on a control system must be of a high caliber, have a good understanding of power system operations and the technical skill of a precision instrument man. Such people are not found every day.

Thus a continuous training program is essential. Personnel capable of learning what is required are also future supervisors, and will progress as everyone should. If they cannot progress within one organization, they will go some place else.

In setting up an educational program, it has been found that key personnel, if given the opportunity, are the best instructors. It is always beneficial, of course, to obtain the services of factory representatives when possible. It can be summarized that education of all concerned is the most important function of one who is responsible for the operation and maintenance of a control system. This education effort is important, not only at the technical level but throughout the company, for the more people who understand the basic functions and operation of the control system the easier it is to solve the day-to-day requirements of keeping it working at peak efficiency.

A paper by K. N. Burnett and R. G. Livingston described General Electric's new multiplant load frequency control system. This system utilizes an automatic penalty factor computer as an element in automatic dispatching. Thus it is possible to continuously calculate and evaluate transmission line loss penalty factors and inject these data into the automatic dispatching program to produce the lowest cost delivered power for any system load condition.

Underground T & D

B. L. Peter, Sponsor

Robert Remington, Westinghouse, reported on the economics of serving commercial load at 120/208 v and 265/460 v. On the basis of generalized studies and a number of specific case studies, the higher secondary voltage has proved to be economical to the utility serving the load. In addition, the spot network-radial system, where transformers are paralleled at one location, is more economical than the conventional secondary network.

M. H. McGrath, General Cable Corp., told of recent developments in power and control cable. To eliminate the build-up of voids, he emphasized that utilities use the kind of cable oil recommended by the cable maker in solid-type cable. Use of transformer oil presents the hazard of not absorbing the hydrogen generated by ionization. Pirelli-type high-voltage cable laid in sand in concrete troughs was selected in a recent installation over a pipe-type cable because of lower installation costs and elimination of a pressure control system for the oil. Two problems being studied by AEIC are a low cable power factor that will remain low and means of controlling precisely the environment of both pipe-type and duct-installed cable. He pointed out that a change in power factor from 0.2% to 0.5/6% would cut

the rating of a 320-kva, 350-kv cable down to zero. McGrath warned against the use of Freon-nitrogen mixtures for finding cable leaks. Freon will saturate somewhere along the cable, can raise the power factor to 16% and bring about cable failure.

J. B. Bowen, San Diego G&E, reported only one failure to date in seven years' experience with unshielded, 5-kv, rubber-insulated cable used generally as substation risers. Cause of failure was not determined, he said. Installed cable includes 25,000 ft of 500 MCM, 2,000 ft of 4/0 and about 13,000 ft of 1/0. Of 37,000 ft of 5-kv unshielded cable in sizes 6, 4 and 2, used as services to vaults, one service failed after three years because of corona cutting, another failure showed evidence of mechanical cutting and a third was a phase-to-ground fault. Bowen also reported on the 1955 activities of the Western Underground Committee.

Installation of a 12-kv residential underground system at Carmel Meadows was described by F. M. Boxold, PG and E. Most of the work was done by the electrical contractor on the job, with PG and E crews handling installation and connection of transformers, and splicing and connecting of 12-kv cables. Secondary system was designed with ease of maintenance in mind, using fittings that can be broken down using wrenches only and without cutting cables. Primary cables bolt to short copper bus in transformer housings that serve as primary junction points. For future installations, PG and E feels the contractor should install only conduits, junction boxes and concrete structures. Use of PILC 12-kv cable, instead of single-conductor, shielded cable with ozone-resistant, rubberlike insulation and neoprene jacket would be considered. Also, either overhead transformers with wiping bushings or standard underground transformers would be used, with preference to the overhead type because of the self-protecting feature available. Finally, smaller secondary cable with closer transformer spacing would be used to reduce the initial cost.

F. M. Milam and Harold Garner, PG and E, described the design and installation of the 12-kv residential underground system made on the Mills Estate south of San Francisco (Electrical West, November 1955, pp 75-77).

R. C. Blankenburg, Southern California Edison, presented a group of "aids" that consider some of the typical multiple choice circumstances present in the planning of residential underground distribution systems. These aids facilitate the correlation of the several variable factors and point to the economic consequences of different choices.

Transportation

D. K. Madison, Sponsor

Improved estimates of required facilities and their cost, simplified planning, more adequate shops and improved shop efficiency are among the advantages of standardization of automotive repair shops and equipment, according to E. W. Ferguson of PG and E. Standards set by his company include 16x40-ft work stalls, 40 vehicles per stall for service and light maintenance work, 30 ft service pits with collapsible safety rails, doors that are 12 ft wide and 13½ ft high, and many other points that are the same in all shops. The big cost savings by standardization are found in engineering and planning, he said.

The question of automatic transmissions for utility company automobiles and light service trucks, in a discussion led by Eugene Howell, Sierra Pacific Power, brought out several favorable reports. In general, the automatic transmissions are paying off in less maintenance work, less wear to clutches and other parts because of poor driving and, most important, in much better recovery values from trade-in or sale. R. S. Baird, General Telephone Co., said later model autos with automatic transmissions are giving a recovery value as high as 38% for his company, as compared with former standard transmission or early automatic transmission cars returning about 12%. Driver morale and improved efficiency in sand and snow are among other benefits reported.

R. L. Franklin, Arizona Public Service, reported on his company's studies on the feasibility of annual trade-in or sale of passenger and light vehicles. Capital fund use would be about $158.46 a year more on the annual change basis for a $2,000 vehicle, as shown in an illustration Franklin presented. Operating costs are pared considerably, with little tire replacement, wear on minor parts or replacement of batteries. Maintenance costs are reduced to practically nothing. Arizona Public Service has not initiated the plan yet, but Franklin said it may be attempted if it does nothing but break even with the present system.

Determining what vehicle repair and maintenance work to farm out to local vendors is a problem that varies with different companies, but N. J. McKenzie of Southern California Edison said availability of company manpower is the biggest factor to be considered. His company has added a large number of vehicles in recent years, as have most others, but added few shop personnel and have more work done by contract. Main justification is that contract prices include total costs, while maintaining shops and equipment has many hidden and indirect expenses.

G. P. Larson, PG and E, told the group that "if a truck is ever required to work off the road, it should be a 4x4 or 6x6." The extra cost of four- and six-wheel drive vehicles is usually made up by saving crew expense lost when two- or four-wheel drive vehicles are mired down, and also by saving time lost in scheduling crews to jobs their particular trucks can handle.

Ryan
Southern Nevada Power

Madison
San Diego G&E

Convention Highlights

PCEA's 1956 convention will be held in Las Vegas, May 14-16. Following are some of the program highlights:

•

Management Development
PHILIP D. REED
Chairman of the Board
General Electric Co.

Selling
TYLER McDONALD
Hixson & Jorgensen

Selling Television
E. R. TAYLOR
Vice-president, Motorola

Personnel and Human Relations
A. G. PATTERSON
President, Square D

Distribution Situation
ARTHUR W. HOOPER
Executive Director, NAED

Interdependence
P. HOWARD FARLEY
Sales Promotion Manager, NECA

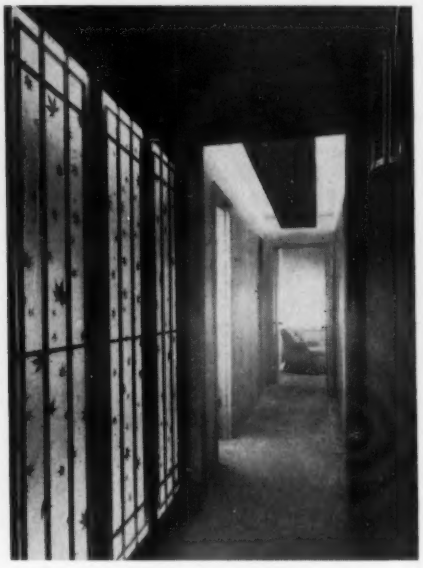
Management Development
DR. HAROLD D. KOONTZ
UC, Los Angeles

Psychology in Business
DR. GILBERT BRIGHOUSE
Occidental College

Subjects Unannounced
C. H. MOSES
Chairman of the Board
Arkansas Power & Light Co.

DR. JESSE E. HOBSON
Stanford Research Institute

Approximately 60,000 went through the gates to see 18 model homes in the Phoenix Parade



Lighting was featured by A. T. LaPrade

Model homes on parade

Promote Modern Living

Arizona Public Service Co. sponsors Reddy Kilowatt contest to encourage effective use of its services

How a utility can promote its own services and at the same time contribute to the success of a community project was ably demonstrated by Arizona Public Service Co. during the recent Phoenix Parade of Homes. To encourage the 18 builders in the Parade to emphasize adequate wiring, light conditioning, air conditioning and complete kitchen-laundry areas, the company sponsored a Reddy Kilowatt Trophy Contest. Grand prize was a two-week trip to Hawaii for two.

As a result the 60,000 people who visited the model homes during the two-week Parade saw how the company's services can be used effectively in modern living. Publicity on the show also stressed what couldn't be seen—the wiring.

Built to encircle a dead-end street, the 18 homes represented a $500,000 venture. Individual houses ranged from $14,000 to more than $25,000. Despite rain on two of the three week ends the show was open, crowds paid the 50c admission fee to see the well-publicized event, which opened during Arizona Home Week with special ceremonies attended by state and city officials. Participating builders were so well satisfied with results that they intend to repeat the Parade next year.

Once it had decided on the contest, Arizona Public Service was careful to get full details into the hands of all concerned—builders, manufacturers, distributors and others. A leaflet explaining the contest and how entries would be judged and a folder of ideas was sent to builders by L. H. Shaff, residential sales manager. Company personnel was available to answer questions and help wherever possible.

The contest was rated on five categories, with a total of 100 points divided as follows: certified adequate wiring, 20; light conditioning, 15; equipment and engineering for year 'round air conditioning, 15; completeness of kitchen and laundry equipment, 25; other features contributing to comfort, convenience and beauty through the application of electricity and/or natural gas, 25.

All of the homes had improved wiring. Ten of the 18 were certified and 17 had service capacity of 100 amp or more. Four houses approached the standards for light conditioning, with such features as luminous ceilings, valance, cove and under-cabinet lighting; effective garden and outdoor lighting. All 18 homes had better than average fixtures and improved lighting levels.

Many of the builders used color and built-in appliances in their kitchens; several incorporated time and step-saving features to earn extra points in the contest.

To avoid giving the utility winner an unfair advantage during the Parade, the decision was not announced until the final week end.

The winning home, built by Associated Builders & Herman Chanen Construction Co., was in the $26,000 price range; was designed for eye appeal as well as convenience. It has such features as a private, glassed-in patio off the bath; a stone wall with broiler in the family room; a pass-through serving counter from kitchen to dining

Luminous ceiling panel and a section of the electric kitchen in the Associated Builders home, winner of the Reddy Kilowatt Trophy

room; sliding doors; music and intercom system.

Wiring was done by Arthur Electric Co. Electrical features:

Service equipment — 2-in. conduit, three No. 1/0 and one No. 6 service conductors, 200 amp, 4-PSN main switch.

Circuits—20 circuits; circuit breaker protection, conventional switching.

Appliances — Westinghouse built-in range top, oven, refrigerator and freezer, water heater, washer-dryer, dishwasher, food disposer, exhaust fan and hood, refrigerated air conditioning.

Special features—AW certified path of light switching, light conditioning including under-cabinet lights, luminous panels around living room fire place, extensive patio and garden lighting, dramatic use of Lightolier Starlight cluster fixtures.

Special Mention

In addition to the winner, Arizona Public Service gave plaques to two runners-up—Frank Knoell Construction Co. and A. T. LaPrade Construction Co. Craven Electric Co. did the wiring for the former; Valley Electric for the latter.

The LaPrade home also has a 200-amp, 4-PSN service panel, with 16 circuits, circuit breakers, conventional switches. General Electric appliances are used in this kitchen and include a built-in range and oven and wall refrigerator-freezer. The air-conditioning equipment is Borg Warner's new liquid system with individual room units and controls.

The Knoell home uses gas appliances; has 8 ft of split-circuit three-wire Plugmold strip in the kitchen for convenience and flexibility. The living room has built-in hi-fi.

Both these homes have special lighting features. Knoell put a luminous ceiling in the kitchen, lighted valances in dining and living rooms and the master bedroom (a total of 30 ft), safety lighting on all corners of the house, controlled from bedroom and front door. LaPrade installed luminous panel walls for effect, put cove lighting in bedroom hall and a luminous ceiling in the master bath. Special cut glass fixtures were used in entry hall and dining room. LaPrade also made effective use of outdoor and garden lighting, installing many of the Shalda hooded units.

Don Willis, vice-president in charge of sales for Arizona Public Service, presents trophy to grand prize winner, Nate Rosenbaum of Associated Builders. Looking on are Arthur T. LaPrade Jr. and Frank E. Knoell (far right) who tied for second place

Hoffman
Hoffman Electronics

Lauritzen
S.D. Junior College

Durning
Achtenhagen

Bunce
Contractors Division

Harmel
Look

Wolkenheim
A. O. Smith

Meise
San Diego G&E

Anderson
Morrison Supply

Byrum
Ets-Hokin & Galvan

Burgener
Acting Mayor

Sherwin
San Diego G&E

Industry has

Bright Future

San Diego conference speakers tell how to prepare for it

Another fast-moving program was presented to a full house by the San Diego Bureau of Home Appliances at its Winter Conference, Feb. 29. Approximately 500 attended the dinner meeting, which was addressed by two industry speakers—H. Leslie Hoffman, founder and head of Hoffman Electronics and Laboratories and RETMA president, and Stanley E. Wolkenheim, director of marketing, A. O. Smith Corp. Songs by Vaughn Monroe, "the voice of RCA-Victor," an off-the-cuff bull session by a manufacturer's panel, reports of bureau activities rounded out the program.

A feature was presentation to the Electrical Contractors Division of *Look* Magazine's award for the best coordinated industry Better Wiring program. The trophy was presented by Dick Harmel of *Look* and accepted on behalf of the division's executive committee by C. J. Bunce.

Are We Ready for the Future?

Although there is more real value for the dollar in today's appliances than ever in history, as the customer sees it, the big wonderful appliance is not as wonderful as we would have it, Wolkenheim stated. Bad public relations, bad selling and poor service are at the core of this dissatisfaction, he believes.

Today the manufacturer in his laboratory is dreaming of new and wonderful things, of stepping up production; the distributor and dealer are in a squeeze; the customer is getting cagy. It is time, Wolkenheim thinks, for all segments of the industry to shoulder the selling responsibility and embark upon a sane program.

The manufacturer must assume his share of the responsibiltiy to take the product through the distribution pipeline, to assure himself that all areas of the business are properly safeguarded. He must learn to develop his business in a stated, steady volume; must state

(Continued on Page 117)

ELECTRICAL WEST SALES GUIDE © APRIL 1956

News Letter

FOR THE ELECTRICAL MERCHANT OF THE WEST

Dream and realities

With the GM Motorama when it visited the West recently were three complete kitchens—the Kitchen of Tomorrow, 1956 version; the Kitchen of Today; the Holiday Kitchen scheduled for production late this year. The experimental kitchen was in monochrome in contrast to the pink Kitchen of Today and the Holiday Kitchen's combination of pink, mauve, charcoal and white. Some of the wonders of the dream kitchen: a big glass dome oven that bakes, broils or barbecues food in full view; a marble countertop with concealed induction heating units that will boil water in seconds without heating the marble; an ultrasonic dishwasher; a recipe maker that delivers one of 1,000 cards at touch of a code button, automatically selects and measures ingredients by use of IBM punched cards; a rotating refrigerator with freezer compartment that can be loaded by the delivery man outside the house. The modular Holiday Kitchen is free-standing and self-supporting with its own walls, lighting, plumbing and exhaust facilities. Some of its features are reminiscent of earlier experimental kitchens. Answering anyone who might wonder what practical good Frigidaire gets out of the hours that go into designing the Kitchen of Tomorrow, LeRoy Kiefer, head of the exhibit design department, G-M styling section, pointed out that it serves as a laboratory; that some features of earlier versions have been adopted, some modified, some by-passed. Occasionally an idea is so immediately adaptable that it goes right into the Kitchen of Today.

Full line

Admiral reportedly will produce a full line of kitchen appliances after it completes its new Galesburg plant sometime in 1957. It already makes built-in ovens and surface cooking units; will add refrigerators and freezers, automatic dishwashers, waste disposers and sinks.

Back to work

In an all-out effort to take up the slack in dealers' stocks caused by the 156-day strike, Westinghouse is employing more people and upping production of appliances as much as 35% as compared with prestrike levels. By late July and early August it will be distributing a complete new line of built-ins.

Cooked their own

Guests cooked their own hors d'oeuvres in a Tappan electronic range at the announcement party and demonstration staged by Thompson & Holmes in San Francisco. The range's performance created warm enthusiasm; the price (about $1,200) and a suggestion that the range be supplemented with conventional equipment cooled it off a bit.

Finding that it was getting a good many requests for aid in securing part-time appliance demonstrators--more than it could fill--Arizona Public Service Co. tried an experiment. It invited all women interested in this work to attend a meeting at company headquarters. According to Ruth Kruger, home service director, the program would have seemed worth-while even if only 10 or 12 had come; actually there were 52. The women were told the possibilities of work; what the dealer and manufacturer expected of a demonstrator; how the power company would help them. Personality and mannerisms were discussed and a model demonstration was given. Since the meeting the department has kept in touch with the group by sending a speaker to an organized demonstrator meeting and lending equipment.

Plan works

More than 2,000 businessmen were guests of Southern California Edison last month at a series of 60 grass-root breakfast meetings to launch the company's participation in the Live Better--Electrically program. Meetings were held in the 30 Edison districts. In most cases, breakfast was served in company Electric Living Center kitchens, with home economists as hostesses and the district manager as master of ceremonies.

L B E Breakfasts

As a customer service, Pasadena Light & Power Department repairs about 1,200 small appliances a month on a cost basis. It keeps about 10,000 repair parts on hand.

Repair jobs

Approximately 850 new homes were connected to lines of Riverside Department of Public Utilities during the first quarter. Tract development is active in the area, with some 740 electric kitchens going into these homes at present. The department installs the oven and cooking top. Sale of dryers is expected to pick up with change in the city ordinance requiring 100-amp main switch and four spare circuits.

Building active

A survey made in the Rialto area showed that 60% wanted electric kitchens, according to D. B. Wheelock, commercial vice-president of California Electric Power Co. The survey was in connection with the Homerama (12 model homes) which drew 120,000 people. The show will be repeated in September.

Want electric

Montana Power Co. has launched a home assistance plan at Great Falls and Billings. It is giving information on proper wiring and will help with financing either through agencies or as an addition to the electric bill over a 12- to 36-month period. To encourage use of electric appliances, it is offering $25 on a range replacing gas, wood or coal; $25 on a water heater; $10 on a freezer, clothes dryer or air conditioner. The certificates are good at all dealers and apply in addition to a trade-in.

Sales aid

Dates on the Outdoor Living Show at Los Angeles have been changed to May 18-27 at the new Great Western Exhibit Building, 2120 Eastern Ave...The Los Angeles Home Show will be held June 14-24 at Pan Pacific Auditorium.

Coming shows

Colorado Farm Council is promoting sales of electric ranges and water heaters during April, May and June. A "hot" range for demonstration on each dealer's sales floor is a key part of the campaign.

Promotion

Ray King, who has been in the appliance business for 25 years and now has the Ray King Appliance Center at Van Nuys, is the new president of the Los Angeles Electric League. More than 250 present at the installation heard Outgoing President Elwood Reeves, Magnavox, review 1955 accomplishments. King reported that the league, with 411 members, is now the largest dealer-distributor-manufacturer association west of Chicago. Other officers for 1956 are Jack Herbst, Hoffman Sales, executive vice-president; Floyd Lovelace, Department of Water & Power, secretary; Leo K. Allen, Barker-Allen Electric, treasurer.

New officers at L.A.

To convince dealer management that it can do things to increase sales without a new store front, San Diego Bureau's current sales training course lays special emphasis on the dealer-customer relationship. As described by Bill Durning, Jerry Achtenhagen & Sons, the series, which started March 8 and will run into May, is divided into two parts. The first three sessions, for dealers only, will take up advertising and promotion; handling trade-ins (with a speaker from the auto industry); how to increase profits by training salesmen. Following this dealer seminar there will be a brand new series designed for all salesmen from the newest to the most experienced. Formerly dealers have been asked to tell their salesmen about the course; this year they were urged to bring them to the first session. That way the salesman gets to the first session; has the incentive and obligation to complete the course.

Don't need new front

Snake River Valley Electrical Assn. now takes in the entire State of Idaho. Before adoption of the new policy on Jan. 1 it had accepted membership in the northern half of the state only. It is expected that the new territory will triple membership and that the increase, with the new group insurance plan, will step up activities in 1956. The association already has sponsored a Safety Essay on Electricity program following up National Electrical Week. Participating were fourth, fifth and sixth graders in northwestern Idaho and eastern Oregon areas covered by KIDO and KBOI TV. Ten thousand electrical safety check sheets and 1,500 ABC of Home Wiring magazines were distributed to the children. The contest was broadcast every evening for a month on the 6 p.m. TV children's programs and cash prizes ranging for $1 to $10 were presented on TV. The papers were screened by the Live Wires, wives of association members.

Bigger area

SRVEA in cooperation with Idaho Power Co. is sponsoring a Parade of Homes, which will display at least 12 all-electric homes. It is planned to show the houses to about 15,000 people to promote sale of better wiring and more electrical equipment in future Idaho homes. The parade is scheduled for the middle of June.

Parade of Homes

About $20,000,000 were spent by the American consumer last year on kitchen remodeling, according to a survey made by Hotpoint. Only about 7% of the appliance dealers nationally are exploring this new field, however. Some 159 top remodelers in 19 major cities covered by the survey said that they averaged between 45 and 65 remodeling jobs last year with an average of $1,700 each. Some 86% stated that they employ a remodeling specialist, considered him essential to successful operation.

Fertile field

About people

Westinghouse announces that F. E. Maguire is merchandise manager of pre-fab and mobile homes sales and J. G. McKinley is merchandise manager for builder and apartment house sales for the electric appliance division...George R. Hill has been appointed to the newly created position of advertising and sales promotion manager of Trade-Wind Motorfans Inc...Fred T. Grant is now North Pacific district sales representative for the Westinghouse Electronic Tube Division, a new position...Hoffman Electronics Corp. has named James E. Herbert vice-president of sales; new San Francisco general manager of the sales division is John Chadwell, who succeeds John Barker...Among new appointments in the national sales organization of Norris-Thermador Corp. is the promotion of Howard N. Kresge from San Diego district manager to Eastern regional manager. William H. Mackey, Los Angeles-Southern California district sales representative, is now district manager in New York City and parts of New York State and New Jersey. John L. Mooney is new district manager at San Diego...Clarence P. Kommers is supervisor of residential sales for Montana Power Co., a new position.

From manufacturers

The new Magnavox-built Sparton line of television receivers is making its appearance in areas not covered by Magnavox. The same method of distribution--factory to dealer--is being used...General Electric's tube department is urging service dealers to tie in with a national advertising program called "Circus of Values."...Lyle Harsch of Ranchers Appliance Co., Cheyenne, Wyo., won first place in Du Mont's window display contest. Prize was a Chevrolet sedan. First national prize winner among salesmen was Jack Kirk of B. K. Sweeney Co., Denver, who received a Chevrolet station wagon...Westinghouse has retained Raymond Loewy to design future television receivers ...George LaMont Richards, president of Western Supply Co., Salt Lake City, won the Charles Francis Adams Jr. President's Trophy of Raytheon Mfg. Co. The award is for outstanding performance in sales of television and radio products...Norge has raised prices of washers and dryers $10 a model to cover higher costs of components.

Sells assets

Hallicrafters Co. stockholders have approved sales of company assets to Penn-Texas Corp. Management will continue unchanged.

New firm

Harold D. Conklin and Helmuth Tamberg have formed a northern California distributorship of major appliances and electronics. Called Conklin-Tamberg Inc., the firm is located at 420 Market in San Francisco.

Big sign

Motorola Inc. has erected a 75-ft-high signboard at a strategic point near the Los Angeles-Santa Ana freeway. The TV promotion sign is said to have the nation's largest cutout of a human being--an attractive housewife.

New products

A new double oven with separate time and temperature controls is offered by Hotpoint; has also announced production of a new low-cost automatic washer...Packard-Bell's new four-way combination includes a 24-in. TV screen, four-speed hi-fi record player and an AM-FM radio for $475 to $495, depending on cabinet...Two vertical and three chest models are in the 1956 line of RCA Whirlpool food freezers...El-Tronics is introducing an electronic device to regulate dryer timing.

San Diego Meeting

Starts on p 112

and abide by his distribution policy, Wolkenheim stated. All segments of the industry must declare a consumer selling creed that will sell on value, the sum of all services, not price.

Wolkenheim called for a renaissance of salesmanship in which the sales specialist will have equal community standing with the scientist and engineer. "Let's start and continue a Crusade for Better Living through selling," he urged. "We have a great business," he concluded, "but let's fulfill our responsibility; let's see the whole picture."

A Big Business

Recalling that television celebrates its tenth birthday in 1956, Hoffman pointed out that the American public's outlay for TV receivers and their upkeep last year amounted to $3.26 billion. Television-radio-appliance dealers achieved a new stability in 1955, according to Dun & Bradstreet, and failures among retailers across the country are at the lowest point in three years.

With industry statistics pointing to the sale of about 3,500,000 sets on a replacement basis this year, Hoffman suggested that the industry start talking about the things that are new and better about 1956 radios and TV sets.

"How many times have you had a customer tell you about his fine set that he bought in 1949?" he asked. "Have any of these same customers had an opportunity to compare their 1949 set with a 1956 set? .. . If you don't want to go in for home demonstrations, why not display some 1949 and 1950 sets on the floor so that your customers can make their own comparisons . . . Our engineers have not stood still."

There will be a second set business of approximately 1,000,000 sets this year, Hoffman said. The average home has at least two children and those lucky enough to have maids might solve a personnel problem with a second receiver.

Color Is Important Factor

The break-through of color television occurred in 1955. In addition to technical progress in manufacturing, great forward strides have been taken at the broadcasting level, both technical and production. Accelerated color program schedules are promised.

Color is an important factor in your business today and will grow increasingly important. Black and white will continue to thrive; color is a supplementary service, not a replacement, he stated.

Price is not the determining factor in the purchase of a color set, Hoffman believes. People are stepping up in the price bracket of practically everything they buy. "In my opinion, exposure is the key to the whole situation of how to sell color TV properly."

Suggesting that the electronics service business is the great sleeper in the industry today, Hoffman recommended that some consider specializing in electronics.

According to the best forecast, the next 10 years in dollar volume will be approximately twice the last 10 years, with 80,000,000 TV sets being sold at a retail value of $20 billion and 92,000,000 radios with a retail value of $4 billion. To these figures must be added the tremendous market for replacement service, recorders, records, hi-fi, etc.

In another decade, 75% of our business will be from new products that are either now just coming out of the labs or going in, Hoffman foresees. He forecasts electronic refrigeration, dishwashers, laundries and dust eliminators for the home of tomorrow. Television cabinets will become shallower, lighter weight and with a greater emphasis on remote controls. Most of the great improvements in color will come from production engineering and there undoubtedly will be some significant technical advances that will make TV sets simpler to manufacture and operate. But in no case will they eliminate the usefulness being bought with the present color set, he concluded.

Bureau Reports

Bureau President Ivan Lauritzen of San Diego Junior College and Vocational School, and Program Chairman E. W. Meise, San Diego Gas & Electric Co., presided over the meeting. The bureau's advertising and promotion program was outlined by Norman Foster, executive vice-president of Barnes-Chase Co., whose novel and colorful presentation held everyone's attention.

Bill Durning of Jerry Achtenhagen & Sons told about the bureau sales program, which this year is being divided into two parts—a seminar for dealers only followed by a program designed for all salesmen from the most experienced to the newest. Norman Anderson, Morrison Supply, gave recognition to the sales graduates.

Tenth Year

This fall the bureau celebrates the tenth anniversary of its sales training program, which has received national recognition. Ten courses are offered free of charge through the sales training committee and sales training director, Dan Turner. Subjects run from how to get the customer talking to how to close a sale and how to make a profit from the appliance business. The course this spring will take advantage of the experience of those in other industries who have similar problems such as the automotive industry.

J. Clark Chamberlain, secretary-manager of the bureau, was moderator for the manufacturers' panel, which included: Walter Baker, Westinghouse; Louis Csenar, Gaffers & Sattler; William Goldy, Olympic TV; Bill Kuhn, Easy; Wayne Melgreen, G-E Electric Housewares; Reg Payne, Frigidaire; Ed Scott, Tappan; Steve Upton, RCA-Whirlpool; Dick Winter, NuTone.

Manufacturers' panel—Bill Kuhn of Easy at the microphone, Clark Chamberlain, far left

Drawings with this photo showed features of equipment in Mrs. Melvin Abreu's kitchen

All-Electric Home
Throughout your home the modern fuel makes living easier, more comfortable
THE HAWAIIAN ELECTRIC CO., LTD.

Teamwork Sells All-

A long-term power company advertising program is the cornerstone of an industry effort that is selling all-electric kitchens in Honolulu.

The pictures on these pages are all taken from Hawaiian Electric Co. ads which have been running since 1953, when the company started using installation photographs. Actually the program goes back to 1949 when Heco began its Kitchen Planning series in cooperation with the EEI "Practical Pretty" theme and to publicize its own service. The theme has been changed from year to year but the idea is fundamentally the same.

The current series is built around a large photograph of a modern kitchen with smaller photos showing electrical equipment in laundry, living and bedroom areas. Six kitchens are publicized each year, with the series rerun the second half to give monthly insertions.

In 1952 the slogan was "Modernize in Any Mode—Electrically" and the kitchens were of varying types. In 1953 the slogan became "All-Electric Kitchen" and last year was changed to "All Electric."

Each eye-catching ad is designed to make the reader want a kitchen like the one pictured and each has the added interest of showing a local family in a local home. Behind their planning are these objectives: (1) to promote increased use of major appliances; (2) direct attention to the electric kitchen as a center of beauty, efficiency and convenience; (3) publicize the expert planning assistance of the utility's Home Service department; (4) illustrate that if all-electric equipment is advantageous in the kitchen it should be equally so in other rooms.

Each year since the series has been used in Heco's advertising program, the company has received a first award in the Public Utilities Advertising Assn. Better Copy Contest.

In addition to this promotion through its advertising program, the company works through the PCEA Electrical Living Committee with other members of the industry to stimulate electric appliance sales. Last fall the Honolulu *Advertiser* started a Home Modernization program prepared in cooperation with the PCEA committee and with accent on built-in electric appliances. Since October a monthly front-page Sunday *Advertiser* feature has carried the photograph and story of a new or remodeled all-electric kitchen. Approximately 16 kitchens have been written up since October in the newspaper feature series and about 20 all-electric kitchen installations have been used in Heco ads since 1953.

It is estimated that electricity is used for cooking, water heating and refrigeration in approximately 86% of new building in Honolulu. Of the existing homes it is estimated that about 50% are equipped with electric ranges, 44% with electric water heaters and 98% with electric refrigerators.

Hawaiian Electric is cooperating with builders by running tie-in ads of their open houses in the classified advertising sections of both major newspapers and supplying home economists to help show the houses. The response

Mrs. Clifford Kurata has compact kitchen

Heco's ad showed inside kitchen as well as this lanai kitchen of the Edmund Lockes

Electric

has been more than gratifying, Charles E. Nolan, vice-president and promotional manager, reports. In many cases the subdivisions are sold out in one or two week ends and where both gas and electricity are available, which is often the case, electricity has been the predominantly popular choice.

Tracts in the Islands are on a smaller scale than large mainland developments, running from a few lots to approximately one or two hundred. There is practically no speculative building. Model homes are shown and sales are made before building is started in most instances. Therefore, the choice of fuel is up to the buyer.

The trend to built-ins continues and is accelerating, Nolan says. In most of the subdivisions now on the planning boards, some type of built-in equipment is included.

In the company's own Kitchen Planning department, where direct contact with the customer is the general rule, it has been found that the proportion of built-in to conventional-type equipment has reversed itself since 1954. Company records show that in 1954 conventional-type equipment was the choice three to one; in 1955 it was Even Steven; so far in 1956 it is built-in three to one. The homes covered by these figures are not in tract developments and are not apartments. They are homes in which the Heco Kitchen Planning department has started from the beginning with the customer, either working from prepared plans or scale drawings until plans are completed to his satisfaction.

Entirely different type kitchens are shown by Conrad W. Conrad home above and that of the Allen Johnsons below. Small appliances too are shown in the installation photographs

ELECTRICAL WEST

Rush Act on Atomics?

CHARGES that the U. S. is lagging behind in atomic development have opened up a new arena for debate on the peaceful uses of the atom. The stage was set when AEC Commissioner Thomas Murray suggested that the federal government enter the power reactor field to the tune of 2,000,000 kw at a cost of a billion dollars by 1960. Mr. Murray said that the time was too short and the cost too high for private enterprise to develop an atomic power program that would aid in maintaining U. S. prestige throughout the world. From this, it can be inferred that the export of atomic know-how (and fissionable materials) has taken a top-rank importance as an instrument of international diplomacy and the pursuit of the cold war.

A layman cannot presume to question the validity of the reasoning behind this concept. However, if the object is atomic know-how, it is questionable whether the federal government could start such a program at this late date and be any further ahead by 1960 than it would be if all federal road blocks were removed from the rather substantial privately financed atomic power programs that have been under way for several years. If foreign power needs are so urgent that national security is involved, it might be expedient to supply tangible assistance in certain overseas areas. However, Mr. Murray's proposal that 2,000,000 kw of generating plants be built here *and abroad* might well be modified to permit AEC to build atomic plants abroad only. In this way, the experience and overseas assistance could be wrapped up into one diplomatic package without injecting the issue of federally owned atomic stations into the domestic power situation.

The development of atomic power for peaceful purposes in this country is not so urgent that its orderly progress need be disrupted by overseas security commitments. The alacrity with which federal power proponents have jumped on the Murray band wagon gives rise to the suspicion that there could be more to the proposal than mere security implications. Wittingly or unwittingly, Mr. Murray may have led another camel into the camp. In the light of future national power requirements, the animal could usurp the whole tent if the administration's domestic power policies are not clearly circumscribed now.

Glamourized Statistics

THE annual crop of corporation reports generally matures in March. This year, as never before, they proved to be colorful harbingers of spring. They were attractive to look at, interesting to read and comforting to digest. They were reassuring as to the financial soundness of the utility industry. They gave off the spicy perfume of vigorous, healthy growth. Best of all they reflected a healthy vitality in imagination in the variegated methods used to communicate information to the stockholders, security groups and the general public.

In this year's crop an entirely new species appeared. The Arizona variety, produced by Arizona Public Service Co., took the form of the magazine section found in your Sunday paper. Done in four colors and featuring Arizona's spectacular scenery and industries, the report achieved unusual eye appeal through a blend of color, photography and layout. The contents was an equally smooth blend of the company's growth position and its intimate relationship with the development of its service area. It will be surprising if the 1955 report does not bring another batch of national awards to the company.

Wood Poles Meet Competitor

PROBABLY the most prosaic item of system equipment is the wood pole that supports the circuits. Except for a few daubs of chemicals it hasn't changed much in the past 76 years. Most people would have to stretch their imaginations beyond the elastic limit to get very excited over either the pole itself or the prospects for improving it. Yet only last month a new substitute, a fiber-glass pole described elsewhere in this issue, was placed

EDITORIAL VIEWS

on the market. Nobody expects the new product to obsolete the wood pole overnight but it certainly may cause transmission and distribution engineers to take a second look at previous concepts and calculations of cost and performance of overhead circuits.

Critics of the 60-cycle electrical engineer frequently describe his work as "stodgy" and "uninspiring." Power engineering may not have the free-wheeling challenges of electronics but there is still plenty of pioneer country to intrigue young engineering minds and keep their seniors busy with their slide rules, as this new development indicates.

There are many new and challenging developments that make the power industry a fruitful and rewarding area for a career. All too often the scope and breadth of the problems of atomics, area load control, extra high voltage transmission and other similar things obscure the basic fact that everything in the power system, no matter how conventional, can be improved. The fiber-glass pole is noteworthy because it indicates the widespread scrutiny that is being given to all the basic elements of our systems by people who hope to find ways of doing things better. Such is the stuff of which progress is made.

FPC License Wrangle

OREGON Senators Neuberger and Morse have exceeded themselves in dreaming up something new in the field of power politics. Jointly they have introduced a bill (S. 2877) to revoke a license granted by the Federal Power Commission for an Oregon hydro project. The license in question was not granted to an investor-owned company but to the city of Eugene, Ore., for the Beaver Marsh project on the upper McKenzie River. Preservation of the McKenzie's scenic beauty was the purpose of this move.

Such an action is unprecedented. If the Congress takes it upon itself to nullify the actions of duly constituted federal authorities by exercising veto powers over their responsibilities, chaos in regulation is inevitable. In this case, the bill will never come to a vote because the people of Eugene, on March 27, voted down the bond issue necessary to construct the plant. The Eugene Water & Electric Board thereupon abandoned plans for the project. The fact remains, however, that a new factor has been introduced into the problem of jurisdiction over water resources.

But that's not all. This publication was furnished with a copy of a letter, purported to be written by Senator Neuberger, which would have "loaded" the hearing on this bill before the Senate subcommittee on flood control, rivers and harbors. This letter, addressed "Dear Friend," asks that the friend write each member of the subcommittee in support of the bill. It concludes:

"The main hope for the Beaver Marsh license revocation is that sufficient public sentiment can be aroused to support the factual evidence in our favor."

Arousing public sentiment in this manner by civic or business organizations has been condemned on the Senate floor as high-pressure lobbying. What is it called when a senator drums up support for his own bill?

THE philosophy of purchasing management in many major respects is outpacing that of its colleagues in sales management . . . . Through its value analysis program, the purchasing department is doing more toward improving its ability to buy the right thing from the right source at the right time and price than is the sales department toward improving its ability to offer the right thing to the right customer at the right time and price . . . . The interesting part of this development is that purchasing people are using the tools of the trade traditionally believed to be the usual property of the salesman.—Garlan Morse, Pacific Coast Director of Sales, Sylvania Electric Products Inc., before the 37th annual joint meeting of the San Francisco Sales Executives Assn. and the Purchasing Agents Assn. of Northern California Inc.

Electrical West—Vol. 116, No. 4

No. 5 of a series on "Grounding Confusion"

A Solution Is Offered

Tom Hughes
Electrical Engineer
California Division of Industrial Safety

Grounding, as such, is not the answer to the switch and starter explosions that have been discussed in the previous articles of this series. The schematic in Fig. 3 shows why.

This diagram represents a panel in a subfeeder circuit of a large building. As mentioned before, we often find the feeder conduits mechanically and electrically isolated from the main distribution panel, or they may be connected but no attempt made to ground the raceway and equipment in the building to a water pipe although the neutral has been grounded.

Fig. 3 shows how a fault at F_1 can accidentally connect a coil or solenoid operated device in series with the capacity at X_c, to induce the voltage stepup. It may occur as someone closes the switch or circuit breaker at S. A high-voltage arc-over ionizes the air and the whole capacity of the subfeeder circuit is turned loose in the confined space of the panel. Every once in a while a panel is completely gutted under similar circumstances in some large department store or office building.

The solenoid could be a fixture ballast, a solenoid valve in a furnace control, or most anything. In fact, it could be an electrician checking for the fuse blown by the fault, with a solenoid-type voltage tester, or he could make the connection at S with a neon-type tester. Five years ago, a whole 480-v, live-back switchboard went up when an electrician was checking for a blown fuse on the back. He died from the burns.

But why do we say that grounding is not the answer? Because grounding, by that time, leaves the same old confusion in the minds of electricians and inspectors as to what we should be accomplishing. Fig. 4 shows the simple relationship of the components for the series resonant setup and how the remedy works.

The connection through the resistor, from the neutral point of the wye-connected secondary in a three-phase system to the raceway at C accomplishes three important purposes.

First, as we see in Fig. 4, it shorts out the condenser effect (X_c) that existed between the conductors and the conduit. Since the capacitive reactor is eliminated, there is no danger of setting up a series resonant circuit.

Second important feature, as we have stressed earlier, is using the raceway system as a fault current return path for providing faster opening of fuses or breakers. If this is to be accomplished, adequate continuity must be maintained in proportion to the currents to be encountered. On a 15-amp lighting branch circuit, adequate continuity is usually obtained by knockout boxes and locknuts or armored cable connectors. But feeder circuits or branch circuits to large loads should be run in conduit with threaded fittings, or bonded around gutters and knockout-type pull boxes.

Bonding to the steel framework of modern buildings often produces an effective return path. Where open overhead wires feed another building and there is no metal water pipe or other means of obtaining continuity, a fourth wire must be strung with the others to act as the fault return path.

Of course, where a neutral conductor is used in the distribution system, we have merely to tie the neutral to the raceway system. With straight three-phase systems a wye-connected secondary is the ideal choice, but a delta system can be handled, in a large plant or building, by means of a special zigzag connected transformer designed for obtaining a neutral from a delta system. On large installations, the neutral should be tied to the raceway system through a resistor of ohmic value approximately equivalent to that of the total condenser capacity that would exist if it were not by-passed by this procedure.

We realize that such a tie between a neutral and the raceway (on three-phase systems) will be heartily protested by those who prefer the use of ground indicators and the isolated system. Their contention is that, as long as they know when a fault appears from one phase to the raceway or ground, they can clear it up at the end of the day or over the week end and no harm is done. But that was the procedure supposedly being practiced at the point where this switch in the picture blew up. (See previous articles.) Such a mode of operation can be dynamite, as we have seen.

Third benefit of tying a neutral to

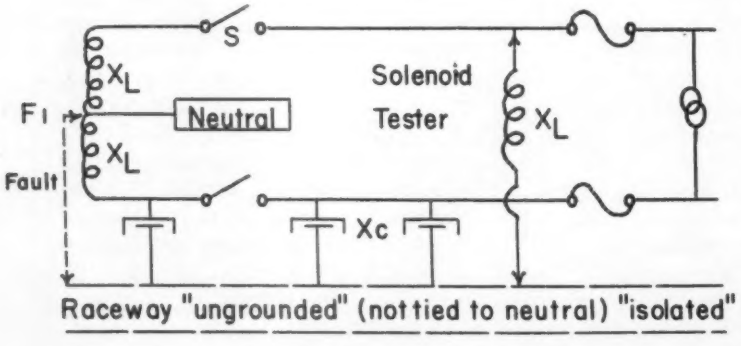


Fig. 3

Fig. 4—Dotted line represents the raceway system. X_c represents the distributed capacity that exists between the ungrounded conductors of any system and the metal raceway and cabinets. The fault at F automatically establishes a path from phase B through the inductance X_L and capacitance X_c back to phase A. Adding the system ground through R to the raceway system at C shorts out the capacitance X_c and prevents chance of a series resonant condition. It also assures the blowing of the fuse at B. This is the real remedy

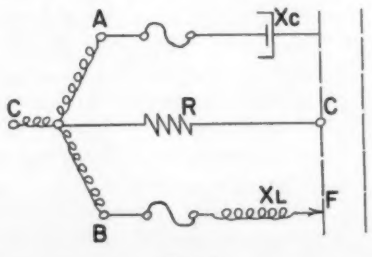


Fig. 4

the raceway is that it facilitates the quick location of any fault between conductor and raceway.

Let's Look at the Record

In California, where the labor laws require the reporting of every on-the-job injury both by employer and the physician attending the injured, yearly statistics are produced. Most of these accidents are investigated later by engineers of the safety division, so that the technical features important to such statistics are ascertained to a greater degree.

The number of the different types of accidents have varied in accordance with the building up or recession of industry, in the last few years, but the ratios hold pretty much the same. Our most serious offender is switch explosions, which produce around a hundred injuries from flash burns each year. Of that number, about a fourth of them are in the motor-rated class.

In checking back over reports of the last few years we learn that about half of the reported switch explosions have occurred when the switch was operated to close the contacts (not to open them, as electricians have always assumed). In at least two cases that we know of, the switch that blew up was not the one that the injured person closed but the one next to it, which was carrying its regular load at the time. One of these was a brand new motor-rated type.

One switch burn out occurred where the load wires had been disconnected for several weeks and the fuses removed. It was connected directly to the 480-v distribution bus with a 1,600-amp main circuit breaker ahead. It was located in a dusty area and, no doubt, the insulators were covered with dust. A Mexican operator was the only witness and was too bound with fear to say what really transpired. Probably, he had been hiding a lunch pail in the box.

There are around one-fourth as many flash burns from arc-overs in motor starters each year as there are in switches. Two or three modern competitive-type plastic case air circuit breakers blow up each year in California (causing injury) and usually twice as many oil breakers. In blow-ups of plastic case breakers it has been supposed that maybe a loose strand from a shunt shorted something but it could just as well have been a high-voltage arc-over from a resonant voltage step-up.

Each year, from 9 to 12 electricians or other persons are flash burned while testing with voltage testers. Of these, a small percentage are caused by the destruction of solenoid types, which were apparently in good condition before the accident.

Since we only get reports on these accidents when a person is injured, the reader should realize that many such flare-ups occur in all this equipment without our knowledge. The reader must also realize that this theory we have proposed, of voltage step-up from a series resonant state, is a difficult one to substantiate by field practice although all the conditions are easily produced in a laboratory. Witnesses to accidents are rarely qualified or observant enough to contribute substantial evidence.

The degree of voltage step-up has been shown in a few cases where the striking arc occurred from exposed brush rigging or terminals to the frame of a motor or other such machine. The distance of the arc gap in clean air proved the existence of a momentary potential of several thousand volts and the nature of the damage to the windings would confirm their agency as the inductive reactor of a series resonant circuit.

Since personal injuries are seldom produced by motor burn outs or punctured insulation, we have no statistics on motor failures. All information in this field comes from accounts we receive from electricians or motor servicing outfits, and usually long after the damage has been remedied. The same applies to the destruction or damaging of fixture ballasts and other such solenoids though we do hear of occasional instances of their sudden end with no apparent explanation.

Editor's Note—Next issue will begin the second part of this series, that dealing with portable tools and equipment.

Area lighting system in drafting and estimating office of Ets-Hokin & Galvan, San Diego

Gives Customers an Example

There is nothing like an actual example to convince prospects of the worth of a luminous ceiling installation. Both to use as an example and to derive the eye-saving benefit of it for their own staff estimators and engineers, Ets-Hokin & Galvan at San Diego has installed one itself. The 33x19½-ft room with a slanted ceiling was given a new plastic ceiling at 8 ft, 8 in. over which 24 two-lamp strip fixtures were mounted on 3-ft, 3-in. centers, lamped with 96-in. T-12cw, 430-ma lamps. The cavity, 14 to 19 in. deep, crosswise, was painted a matt white of 80% reflection factor; the walls off-white of 75%; the floor tile has a buff of 55% with green squares of 25%. Readings on completion showed Benjamin's Panel-Glo ceiling to have 265 f-l, walls 95, drafting table 70, and 190 f-c on drafting table, 150 f-c on desks along the wall. Wattage per sq ft is 6.9.

Matt Gallagher presided (standing), Harry Dobson was chairman as Santa Barbara's . . .

Show Boosts Wiring

So successful that everyone—exhibitors and sponsors—decided immediately to stage another next year was the Adequate Wiring Show and dinner staged by the California Central Coast Chapter, National Electrical Contractors Assn., and Local 413, IBEW, at Santa Barbara's Miramar convention center, March 2. Opened at 1 p.m. to the public the show drew those interested in home building that afternoon. But for the dinner and program that night the 200 seats at the tables were filled with architects, engineers, builders and general contractors as guests and NECA contractors, utility sales personnel and distributor men.

Prior to the dinner for a short time and after the dinner program for an hour until the door prize drawing the 30 exhibit booths around the hall were visited with keen interest by all attending. Some 25 makers of electrical supplies and equipment exhibited and all expressed enthusiasm for results.

Program for the dinner was tuned to the idea of home wiring modernization and adequate wiring of all future building. Matt Gallagher, NECA chapter manager, presided. Harry V. Dobson, former city electrical inspector, now consulting engineer, who was chairman of the local committee staging the show, was first speaker. From his inspector experience he told the importance of planned adequacy in wiring.

Luke Spencer, Bank of America, described the various means of financing available, either through FHA Title 1 or in a variety of bank plans for electrical modernization of existing homes. William A. Cyr, consulting editor, ELECTRICAL WEST, urged full cooperation with the national promotional programs, particularly the Housepower promotion of EEI. Joe Long, Santa Barbara division manager, Southern California Edison Co., praised the contractors and union for the excellent show.

Committee members responsible for the affair in addition to Dobson nad Gallagher were: Dave Milne, business manager, Local 413, IBEW; Bob Murphy, Jack Windstrom, contractors; Glen R. Anthony, Southern California Edison Co.; Jim Bradsberry, city inspector, and Dave Raber, Raber Wholesale Co. Exhibitors included Ruby Lighting, Blakeman switches, Marco lighting fixtures, Arrow-Hart Hegeman Co., Jim Shirreffs, Westinghouse, Awalt meter enclosures, Scotch tapes, Shalda fixtures, Remcon remote control system, BullDog switches, Prescolite fixtures, Schull agency, Pryne fans and fixtures, Duro, Bryant wiring devices, Thomas & Betts, Republic EMT, Wiremold, Benjamin fixtures, Nutone fans and fixtures, also built-in food preparation center, Federal-Pacific switches, General Air Conditioning, Triangle, Sylvania, and General Electric lamps, wiring materials and Trumbull panels.

Gallagher hopes to stage a similar meeting and show in San Luis Obispo in the fall as well as to repeat the Santa Barbara show next year.

Island Inspectors Expand Chapter

Peace and cooperation have returned to heal the results of an eruption in the Hawaii Chapter, International Association of Electrical Inspectors, during Electrical Week in February. An official visit to the Islands by IAEI President Larry Trim of Burbank; Charles L. Smith, IAEI secretary-treasurer, Chicago; and James Ambrosi, Southwestern Section president, Oakland, with meetings both at Kauai and Honolulu, plus numerous conferences, seems to have healed the wounds and brought the group together again. In a resolution passed by the officers and members of the advisory board, agreements were reached to let bygones be bygones, work in accord with the IAEI constitution, revise chapter by-laws and build up the organization of the chapter with Island divisions before requesting section status again.

It proved a busy week end for the officials, including a board meeting on arrival Feb. 9, a meeting with the supervisors at Kauai Island to discuss the possibilities of an electrical ordinance, a dinner and meeting that night at which each of the officials spoke and a temporary organization, the Kauai Electricians Club, was set up with William E. Fernandez of Kappaa, Kauai, as chairman. The annual dinner meeting of the Hawaii Chapter was held at the Pearl City Tavern Feb. 11, with 86 present. L. O. Trim, IAEI president, presided and speakers included Charles L. Smith, John T. Carey, the newly re-elected chairman, and J. L. Ambrosi. John T. Carey was installed as chairman, Samuel Haae vice-chairman, Francis M. McKinney secretary-treasurer and on the advisory board, J. C. Jacksick, George Leo, Takee Kanai, Masao Mori, E. L. Ralston, K. E. Swanholm and A. J. Vivas Jr.

The chapter had been split over the issue of a demand that it be set up as a separate Pacific Island Section of IAEI. Smith explained the financial burden this would involve and why the executive council had denied such a request. He said the matter remained open, pending organization of sufficient membership to take care of the financial burden required from a per-capita proportion of the dues. An effort will be made to set up committees and possibly divisions or branches of the chapter in the other islands.

Subsequent to this meeting, a meeting was held at Maui and a division of the chapter was formed there.

ELECTRICAL WEST Contractors' News Letter

QUICK NEWS ON TRENDS, LAWS, CODES, MATERIALS, EQUIPMENT, COSTS, WAGES, ETC.

Diffused

Luminous ceiling agreement between the IBEW and Carpenters, which was promised for this issue, has become fog bound somewhere, either in protocol or pressure. We are hopeful that the fog, which engulfs not only it but those trying to do this kind of work, will be lifted soon so we can bring you the decision in detail. From horseback it looks as if others see the big potential of business in this method of lighting and are determined to get into the game.

Closer

Surprisingly good progress has been made toward an area agreement as to wages and basic conditions for the entire San Francisco Bay area but it was doubted whether all the wrinkles and suspicions and interests could be smoothed out in time for acceptance this year. The favorable experience unions and contractors have had with the area health and welfare program has shown the value of uniformity and cooperation.

Unity

A four-state line construction agreement is being worked on in Utah, Idaho, Colorado and Wyoming between NECA and IBEW similar to the Northwest line agreement. Contractors hope to regain some line work now going open shop.

On the rise

Remember when copper was so low there was talk of pegging it at 10c a lb in order to keep alive the economy of Arizona, Montana and Utah? Now it is inching toward 50c a pound and may soon be up with gold. This time it is to support the economy of Chile and Africa. Save scrap! Steel wage negotiations are about to start, so look for continued price increases in products using either steel or copper. Wage rates in the entire construction industry appear in for a rise. Perhaps the boom in the business can take it. Opinions differ.

Pioneer

Frank Short, for years a figure in the electrical industry in southern California, died March 24 in Los Angeles. He retired from California Division of Industrial Safety in 1947 with which he had been electrical engineer since 1918 and opened an office as consulting engineer for a group of industrials in Los Angeles, issuing data on codes and regulations applying to industry. He was SW Section IAEI president in 1932.

Give it space

Space for a transformer room is now required in any building requiring in excess of 1,000 amp by the city of Seattle. Underground space in public streets, the council decided, particularly in business areas, is overcrowded. The amendment was asked for by the city's electrical code review board of which Beverly A. Travis is chairman. Space for electrical facilities in a building has always been a problem.

Test jobs

Refrigerated air conditioning will be incorporated in the new Camelback and South Mountain High Schools in Phoenix under a voters' approval of a $2,120,000 bond issue. Of this, $200,000 will go for the air conditioning equipment. These two will be a test run for planning for remaining schools.

Western participants

Winding, cost and selling will be the theme of the 23rd annual convention of National Industrial Service Assn. May 13-16 in Philadelphia. Among Westerners on the program are Earl S. Brooks of United Electric Motors, Seattle, who will moderate a forum on fractional horsepower motors; Carl Lundberg, Cascade Machinery Co., Seattle, a forum on winding; and George Larsen, Larsen-Hogue Electric Co., Los Angeles, a forum on transformers. The national convention was held in Los Angeles last year.

Press outward

Prescolite Mfg. Corp. now has under construction a 45,000-sq-ft additional plant in Berkeley, across the street from its present headquarters. This will double the size of Berkeley plant facilities and provide additional warehousing space for this producer of commercial and residential lighting fixtures, according to Preston A. Jones, president. W. D. Runswick, vice-president, is on a tour of Europe and South America to investigate new trends in design, construction and installation of lighting fixtures.

Start a region

First regional meeting of NISA was held in February, San Francisco, when the national president, Joseph H. Previty, and executive secretary, Fred B. Wipperman, visited the Coast. It is planned to hold annually a regional meeting for members from California, Nevada and Hawaii.

Results rising

Electrical Modernization Bureau in Denver, started in December, already has made a record. It started with 49 electrical contractors to follow up on prospects developed by the Rocky Mountain Electrical League and Public Service Co. of Colorado advertising. Rocky Mountain Chapter, NECA, has put full support back of it. Roy Jussel was recently hired as salesman-estimator to contact customers, tell the need for wiring modernization and to follow up on the 543 requests for information that have been received up to last month. Banks are handling time-payment paper and 22 jobs have been sold for a total of $4,575, an average of $208 per job.

Wish for a star?

Twinkle lamps have been brought out for decorative and toy application by General Electric Lamp Division. They were shown at the American Toy Fair. Available in four colors, red, yellow, green, blue, and in clear glass, they are transparent and designed for use in transformer-operated string sets, permitting multiple burning. They operate on the principle of the bimetal thermostat, alternately making and breaking the circuit.

New lineup

Pacific Electric Motor Co., Oakland, announced changes in management. W. E. Boyd is president, Mrs. Josephine C. Boyd vice-president, K. M. Noble vice-president and general manager, J. W. Allen secretary and manager of repairs and fabrication, and Mrs. M. Holland treasurer. The company has recently issued a brochure on its new department for fabrication of switchboards and control panels.

F is for flash

Flashing fluorescent lamps are now available. General Electric Lamp Division announces for the first time a 40-w rapid-start fluorescent lamp, which can be flashed on and off like an incandescent. It is made practical by the design of a new circuit culminating two years' effort for indoor and outdoor signs. Prediction is that new animation will be given translucent signs using these lamps and circuits. An additional deep blue fluorescent lamp has been added for sign use along with green, pink, gold, blue, red and the standard de luxe whites.

See it done

Shop visits are being arranged by the trade extension coordinator in Los Angeles city schools for students in the day electric motor repair classes to visit local motor repair shops. Approximately 500 students are enrolled in the 23 evening electrical classes, Joseph W. Morosi, coordinator, says. Among the representatives of management on the committee with the school are William Hill, Hill Electric Co.; George Larsen, Larsen and Hogue; O. L. Hood; Lloyd Herron, Sutton & Frost Electric Co.

Double honors

Sam Scott, Graybar manager, Los Angeles, not only is preparing for the PCEA convention at Las Vegas, of which he is president, but for the opening of the new Graybar branch in Phoenix March 31. B. F. Keyfauver is the local branch manager in Phoenix.

School sparring

An important meeting of lighting, architect and school people will be held in Los Angeles early in April. It will bring together from the IES school lighting committee Chairman J. M. Charleton, Toronto, C. L. Crouch, technical director, IES, E. M. Strong, Foster Sampson and John Walsh. From the AIA national committee on school design, Henry Wright, John McLeod, Lee Cochran and Eric Pauley, technical secretary. From the National Council on Schoolhouse Construction, Charles D. Gibson, Wilfred Clapp of Michigan and Ray Hammond, U. S. Department of Education. Previous meeting was at Bar Harbor, Me. Some crucial differences of opinion on brightness are involved.

Bigger base

Lamp Division, General Electric Co., will soon have a new warehouse and offices for the South Pacific Division, according to Ed Herron, manager. Located just off the freeway near the Lever Bros. plant at Malt Avenue and Telegraph Road, the new warehouse will have 100,000 sq ft of space with provision for 44,000 additional when needed, and 18,000 sq ft of offices wrapped around two sides of the building. It will house the large, miniature and photo lamp sales departments as well as the Los Angeles service district. Warehouse will be ready in September, offices by January. It will be the largest warehouse operation of the lamp division to date and serve southern California and Arizona.

Teach new code

Oakland's new city electrical code was brought personally to about 125 electrical contractors, electricians and members of the industry at the meeting sponsored by Gilson Supply Co. of Oakland at its offices on 18th Street March 13. Chief Electrical Inspector Del Hanson issued some 500 invitations to the meeting and the panel of five inspectors discussed the changes and interpretations of the new code in relation to the NECode, as well as answering questions from the crowd. Inspectors Horace Lee, James Ambrosi, Joe Lyle, Phil Abreu and Ben Elboum were on the panel.

IAEI meet possibilities

Approximate dates suggested for chapter meetings of the IAEI that could be attended by Charles L. Smith, IAEI secretary-treasurer, in a tour of the West were announced. Meetings with the Rocky Mountain, New Mexico and Arizona Chapters could be held between April 2 and 6; Southern California, Central California, Northern California and Sacramento Valley April 10 through 14; Nevada, Utah, Idaho and Boise Division April 16 through 19; Oregon, Puget Sound, Eastern Washington April 25 through 30; Montana Chapter around May 1. It is likely that Central California, Northern California and Sacramento Valley will hold a joint meeting, traditionally held at this time. There was talk that the Oregon, Puget Sound and Eastern Washington Chapters might do likewise. No definite dates were announced.

Out of lighting

Mitchell Manufacturing Co., which had started in 1930 making lighting equipment, has now sold its lighting division to Compco Corp., headed by S. J. Zagel. Mitchell was acquired in 1955 by Cory Corp. and is now operated as a division of Cory, manufacturing both Fresh'nd Aire and Mitchell air conditioners. The latter has announced a program of advertising the contractors handling its line to the public as well as selling the product.

People on the move

Some names in the news—Daniel F. Flinn II, who has been with General Electric Co. for 21 years, lately as district manager, Construction Materials Division, headquartered in Los Angeles, has been appointed manager of the machinery and electrical departments of American Factors Ltd., Honolulu, W. L. Doering, vice-president, announces . . . G. A. "Mike" Wintz is the new chief electrical inspector for the city of Los Angeles, since March 1, 1956 . . . Alan Humphrey represents Day-Brite Lighting Inc. in the central California area, headquartered at Fresno. He came from Albuquerque. Recently the same company appointed Charles L. Amick central regional sales manager for Day-Brite. He had been illuminating engineer for the Lamp Division, G-E, Nela Park, and has spoken before Far Western audiences . . . H. I. Peterson has been promoted to assistant treasurer for Underwriters' Laboratories Inc., Santa Clara office . . . Cy Hughes, formerly with Light Control is now with Smoot-Holman Co. at Inglewood . . . Ken Oliphant, for 10 years with the late Thomas B. Hunter, has set up a consulting practice of his own as consulting electrical, mechanical and acoustical engineer at Room 710, 41 Sutter St., San Francisco. A University of Oregon EE with a year of graduate work at Stanford, Oliphant has worked on some of the major projects of the Hunter company for some years . . . George Duncan has left the firm of which he was a partner, Smith, Lindstrom & Duncan, to join California Electric Co., Oakland . . . Al Rockwell, who has been Pacific regional manager for Appleton for lo, these many years, has decided to retire and several changes are being made in the district . . . J. C. Blair from Nela Park has been added to the staff of G-E Lamp Division as a regional market development specialist for residential lighting. He headquarters at the Los Angeles office, has held meetings at Redondo and Alhambra to develop a program . . . George Stallman, who has been Supreme Lighting representative in Seattle, has become Standard Time Co.'s Washington, Oregon and Montana representative . . . Al E. Martin, at one time field representative for NECA in the Western states and previously business manager for IBEW Local 77, died in Seattle March 3. He was 57 years old.

Change in lamps

North American Electric Lamp Co. has changed ownership. The St. Louis manufacturer of decorative and industrial lamp bulbs is now owned by Louis Lander, president and treasurer, Edna Lander, vice-president, and H. N. Adelstein, secretary. No change in policy or product is contemplated.

On tour

Holophane's "Parade of Progress" is due to tour the West next month with special meetings being called by Holophane representatives in each area where shown. It will feature new light controlling lens equipment and lighting fixtures.

Front line

The battle goes on for S. 1644 in Washington. Although out of committee, it had not yet reached the floor of the House. The Senate has passed it.

NECA activity

Montana Chapter, NECA, has engaged a new manager, John McCaughan, a former plumbers' association secretary in Spokane. Prior to that he was a salesman for National Electrical Products . . . Ralph Ecker of Empire Electric Co., Pasco, has been appointed on the Council on Industrial Relations for the Contracting Industry to fill the place of Laurence Rodgers, Oregon-Columbia and Northwest Line Constructors Chapter manager. Pressure of chapter duties caused Rodgers to give up the council post . . . Santa Clara-San Benito Chapter, NECA, in San Jose has developed and put on successfully a blueprint reading course that will soon be adopted as part of the job management course. George Harter, chapter manager, has also conducted foremen's training courses, estimating and accounting courses for that chapter and has an electronics course pending . . . President Oliver Burnett has appointed Clyde L. Chamblin, San Francisco, past president of NECA, on his advisory council. Other Westerners named to standing committees are John N. Corbin, Phoenix, Charles A. Wikle, Los Angeles, Walter A. Soule Jr., Denver, and George B. Schetky, Portland, on the line construction committee; Sidney F. Hill, Los Angeles, and Bert Stiles, Denver, on codes and standards committee; and District Vice-president W. R. Grasle, Portland, and W. P. Robbins, Salt Lake City, on the National Employees Benefit Board . . . Don Boyer, who has been apprenticeship training coordinator for the Los Angeles Chapter, has been put in charge of labor relations and Eugene Jones, a Michigan State industrial psychology MA, will be apprenticeship man, according to Warren Penn, executive vice-president.

Power for industry

A little late is reported the General Electric Industrial Power Forum in Los Angeles Feb. 13-15, jointly sponsored the first two days by Southern California Edison; the last day by the Department of Water & Power. It was held at the Statler, some 500 attending the first day sessions including Edison, General Electric, San Diego Gas & Electric, PG and E, Arizona Public Service, California Electric Power and G-E distributor people, as well as industrial customers. G-E speakers included W. A. Sredenschek, F. W. McChesney, D. L. Beeman, H. L. Palmer, L. Dean Fowler, E. A. Lindsay and R. W. Kise, as well as A. A. Mesko of Hotpoint and Dr. M. J. Martin. Edison speakers were T. L. Van Law, Harold Quinton and Harold L. Moore. Department of Water & Power speakers were Bradley Cozzens, Robert H. Cockfield, William S. Peterson.

Start safety young

An essay safety contest, sponsored by the Idaho Chapter, International Association of Electrical Inspectors, and the Snake River Valley Electrical Assn. is being conducted among the children of the fourth, fifth and sixth grades of the schools in that state. The essays are on safety of proper wiring of the home and installation of all types of appliances. A check sheet of the IAEI is distributed along with the literature on wiring by the Idaho Power Co. and dealers. Judging is done by an industry committee. Radio publicity and newspaper ads are featuring it . . . Idaho Chapter, IAEI, has also been holding a series of meetings, the first three in Rexburg, Caldwell and Nampa, under J. Carl Baldridge, state electrical inspector, to acquaint electricians and contractors with the code. Wholesalers were invited to display new wiring devices and equipment.

Island hop

A Maui division of the Hawaii Chapter, IAEI, was authorized at the March 14 meeting in Honolulu and a meeting set for the week of April 1 at Wailuku, Maui, at which John T. Carey, chapter chairman, and Francis M. McKinney, secretary, will speak.

First class

Los Angeles certified lighting class graduated Feb. 28 practically all of its 38 enrollees. They received a certificate from Los Angeles city schools, also a card from the Electric League. Despite code class competition, attendance averaged 36. Another course was to start April 3 through May 15 for seven Tuesday nights. Leonard Hobbs, Smoot-Holman Co., is organizing the promotional material for local advertising. "This fall I figure we're really going to town," said Ted Shepherd, Department of Water & Power.

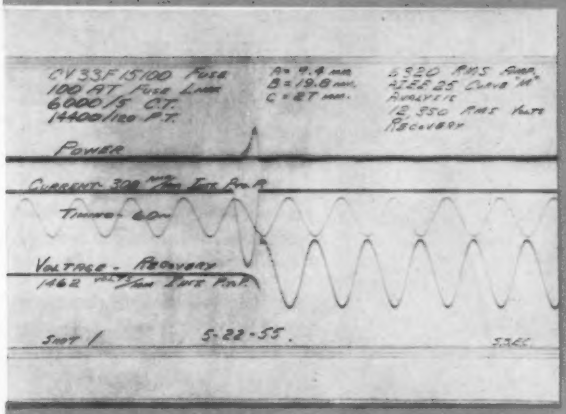
Take power to job

Portable electric generating plants, used in construction projects by contractors, are described in a new two-color folder issued by D. W. Onan & Sons Inc. of Minneapolis. The line runs from single-cylinder models of from 500 to 2,500 w to two-cylinder plants up to 10,000 w.

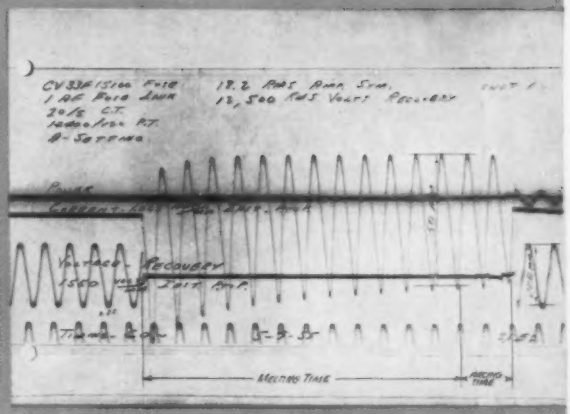
Seeing booklet

"Light, an Aid to Sight" is a new eight-page folder in color prepared by Better Light Better Sight Bureau for distribution in home lighting promotion. Examples of correct lighting are illustrated, lamp placement, bulb sizes and similar information contained in it.

high faults or low faults



HIGH CURRENT TEST In this test the cutout was subjected to a fault of 6320 amperes at a power factor of 19.6%. Arcing time was less than a half cycle. This test was conducted at Georgia Power Company's North Columbus Substation.



LOW CURRENT TEST In this particular low current test, the cutout was subjected to a fault of 18.2 amperes at a power factor of 15.9%. The circuit was cleared after two cycles of arcing time. This test was conducted at Southern States test facilities.

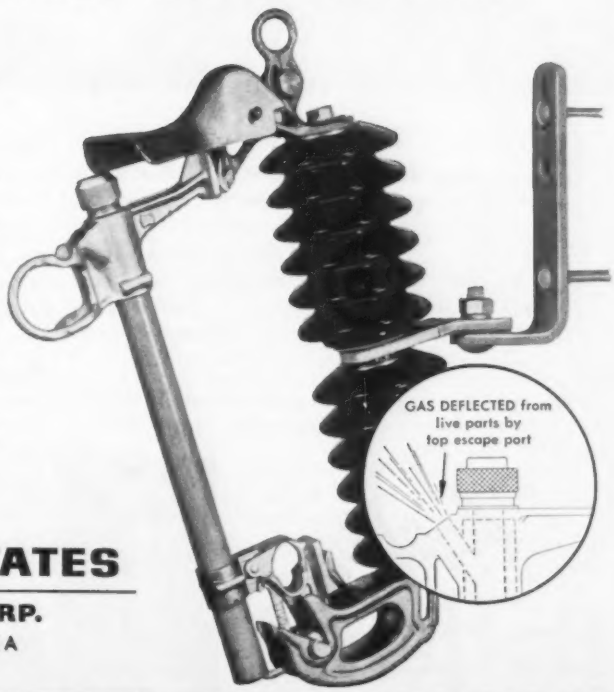
SOUTHERN STATES' CV-33-F TAKES EITHER IN STRIDE

Engineers responsible for system protection often stress the importance of a cutout's ability to clear an overload condition as well as to interrupt maximum faults.

The Southern States Type CV-33-F is designed to give the best possible operation at both extremes.

During its development, Southern States' engineers repeatedly subjected it to both high and low faults. The versatility of the Type CV-33-F Cutout was demonstrated on test after test. Shown above are unretouched photos of oscillograms of two typical tests.

To provide your system with dependable wide-range protection, choose the Southern States Type CV-33-F Cutout.



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IN CANADA:
Dominion Cutout Co., Ltd., Toronto

Widespread Acceptance of Hotpoint Automatic Clothes Dryers

Increases Utility Revenue!

Hotpoint

SUPER DE LUXE SEALED-CHAMBER DRYER

No venting required! (1) Purified, heated dry air (2) takes moisture and lint from clothes (3) cold water spray condenses moisture (4) lint and water are pumped down into the drain.

Hotpoint

AIR-BLOWER DRYER

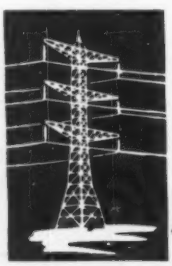
One connection for either 115 or 230-volt operation! Hotpoint quality, features and construction, in a low price automatic featuring Air-Blower drying. New Wide-Screen Lint Filter is convenient, efficient.

Promote the load that promotes profits! More Dryers on your lines mean greater revenue for you. Automatic Clothes Dryers use an average of over 750 Kilowatt hours annually—***and that usage is almost entirely concentrated in off-peak hours!*** With the demand for Dryers more than tripled in just five years, opportunities for increased utility revenue are better than ever.

Promote the dryers that promote acceptance! Hotpoint's leadership in engineering has accelerated consumer acceptance through ***exclusive*** automatic features and dependability of operation. The amazing Hotpoint Sealed Chamber Dryer requires ***no venting*** yet moisture, heat and lint cannot escape into the room. And famous Hotpoint quality and performance are also available in the low-cost Hotpoint Air-Blower Dryer that can be used on either 115 or 230-volt circuit!

Promote the line that helps you promote! Hotpoint provides you with established acceptance in a wide-open market—and backs you up with an aggressive, hard-hitting merchandising program designed specifically for utility use. Get the complete story on how Hotpoint can help ***you*** increase ***your*** revenue. See your Hotpoint Distributor—***soon!***

Again, Hotpoint



looks at Tomorrow, Today!

HOTPOINT CO. *(A Division of General Electric Company)* **5600 West Taylor Street, Chicago 44, Illinois**

PCEA Convention Shapes Up

Accommodations for the 1,000 or more who attend the Pacific Coast Electrical Assn. annual convention at Las Vegas, May 14-16, is assured because the delegates and their wives will be housed in four or more of the ample large resort hotels in a group on "the strip" just outside the business district. Meetings will be held in the new large auditorium of the New Frontier. One of the luncheons will be at the big Riviera. Evening entertainment will be so arranged that each of four big shows will be seen by all who attend. Ladies entertainment will include a tour of Hoover Dam and bingo at the Showboat, a fashion show at the Riviera and other attractions.

The business sessions will be all business and from past experience it is felt that they will be fully attended, despite the distractions of this gay resort. Ample time for play, it was found at Reno, will more than suffice and the business program, of top flight speakers, provides the real meat course for the convention.

On the Program

Speakers include Philip D. Reed, chairman of the board, General Electric Co., New York, as the kick-off luncheon speaker, Monday noon. His subject is, "Management Development." Harllee Branch, president of Edison Electric Institute, New York, is another speaker. Tyler McDonald, Hixson & Jorgensen Inc., Los Angeles, will speak on "Selling." Another selling talk on television will be E. R. Taylor, vice-president of Motorola. A. G. Patterson, president of Square D Co., Detroit, speaks on "Personnel and Human Relations." Arthur W. Hooper, executive director, National Association of Electrical Distributors, will tell of the distribution situation in the industry. P. Howard Farley, sales promotion manager, National Electrical Contractors Assn., Washington, will show the interdependence of the utilities and contractors.

Ronald Reagan, moving picture and television star, will give his vivid and important warning about communist infiltration in the industry at the Wednesday luncheon at the Riviera that will close the convention.

"Live Better—Electrically"

Sam Scott, Graybar Electric Co., Los Angeles, PCEA president, and James M. Tuttle, Motorola, San Mateo, program chairman, have tied in the convention theme with the Live Better—*Electrically* idea, and have fashioned the program to give expression to each branch of the industry.

Convention committeemen in charge are: J. H. Pengilly, Square D, chairman; D. D. Smalley, Southern Nevada Power Co., vice-chairman; Leon M. Guibara, U. S. Rubber Co., vice-chairman; Frank A. Tracy, Sierra Pacific Power Co., attendance; W. O. Kyte, G-E Co., banquet; C. Harold Thrane, G-E Supply, manufacturers and distributors cocktail party; R. E. Gates, Rome Cable Co., golf; Harry Allen, Southern Nevada Power, housing; Walter Lucking, Arizona Public Service, ladies' entertainment; Charles A. Wikle, A. S. Schulman Elcetric Co., host committee; R. E. Fife, Southern California Edison, controller; J. M. Tuttle, Motorola, program; Don Willis, Arizona Public Service, publicity; W. L. Moats, Westinghouse; W. P. Bedgood, Southern Nevada Power, stage manager; Harry Welsh, Southern California Edison, transportation and information; B. F. Keyfauver, Graybar, ushers. Heading all local arrangements is Elmo Elsworth, Southern Nevada Power Co.

Ready the Reports

Many PCEA members are hard at work this month preparing reports for the convention. With the 39th annual meeting just a few weeks away, chairmen are tying together all the loose ends of their year's activities for final reports to section chairmen. The section chairmen, in turn, will combine these into a composite report for presentation at the last session of the convention.

Lawrence Maechtlen, Square D, Los Angeles Electric Club president, directs Dick Gates, G-E, sergeant-at-arms to take the copper kettle fine box to a victim. Maechtlen is a director of the PCEA this year

On Other Fronts

Rating high among PCEA news this month is the appointment of C. L. Neibel of Southern California Edison Co. to vice-chairmanship of the kitchen and laundry committee. He will supervise the committee's activities in the southern area.

The accident prevention committee, under the chairmanship of Carlton L. Yager of Pacific Gas and Electric Co., is continuing its work of reviewing and standardizing the safety rules of utilities.

In keeping with the trend established by many cities and counties, the code and ordinance committee is considering the possibility of amending the Uniform Electrical Code to require a minimum of 100 amp capacity in main service facilities.

Approximately 75 home economics teachers attended a "Know-How Clinic," hosted recently by Southern California Edison's "Electric Living Center" in Redondo Beach. This was the first clinic so far this year, although similar all-day sessions were held last year at Santa Barbara, San Bernardino, Huntington Park, Alhambra and Phoenix, Ariz.

Marjorie Helm of California Electric Power was moderator of the program, titled "Watt's My Line," and speakers and the products they demonstrated were as follows:

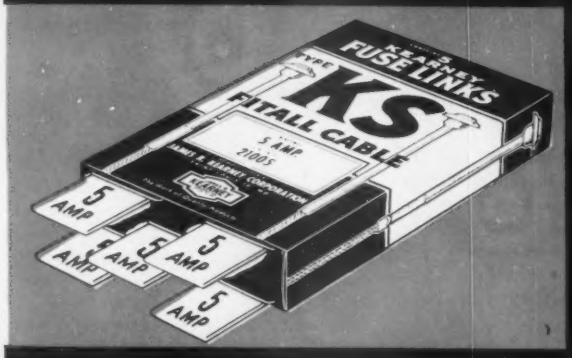
Lorine Craft, Westinghouse, electric range; Ann Coad, White King, fabrics, soaps and detergents; Dorothy Huse of Norge, refrigerator and freezer; Dorothy McLaughlin, All, who presented a skit on "Mrs. Weary Wash"; Miles Houck, Calgon, water softening problems; and Rita Marie Schneider, Graybar Electric Co., washer and dryer.

Barbara Duffy and Mary Riemann, Edison home economists, helped the PCEA home economics committee arrange the workshop. Los Angeles city and county teachers attending received two units of institute credit.

The following companies have been welcomed recently as new members of PCEA:

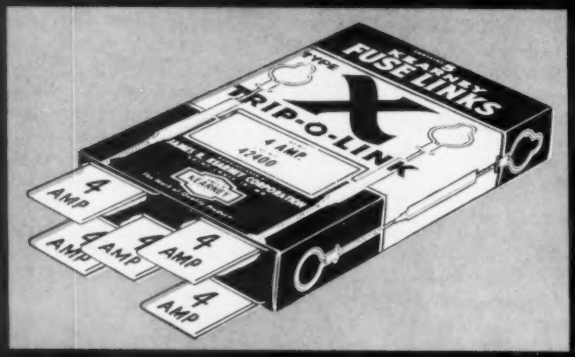
J. Warren Barry, Louis D. Black & Associates, Collins Radio Co., Guy de Leuze & Associates, Gould National Batteries Inc., International Engineering Co., Light Control Co., Lynch Carrier Systems, McCormick & Bester Creosoting Co., Michel Brothers, National Telephone Supply Co., Osborne Electric Supply Co., Pacific Crane & Rigging Co., Reo Motors Inc., Sunbeam Lighting Co., Supreme Lighting Co. and Youngstown Steel Products of California.

KEARNEY Specialized assures complete

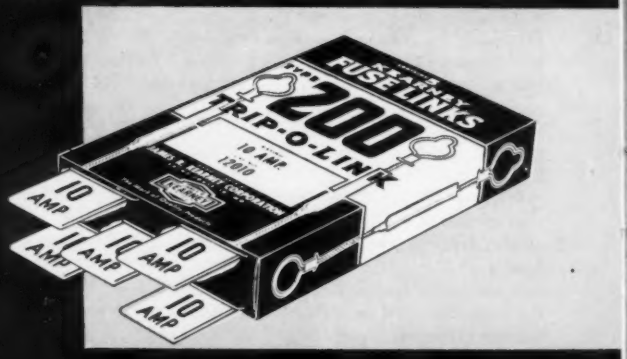


TYPE KS—Specially designed to protect and still keep outages at a minimum on circuits subject to switching and lightning surges. Overload capacity identical with Type 200, but surge capacity is twice as great, for a given rating.

TYPE X—A specialist at keeping transformers in service during heavy overloads and surges—yet clears the fault before damage range is reached. Opens 230% of rated current within five minutes.



TYPE 200—Specially made for troublesome circuits subject to longtime overloads and surges. Overloads up to 150% can be carried indefinitely without damage to fuse link or cut out.



JAMES R. KEARNEY CORPORATION
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Fuse Link Construction protection and coordination

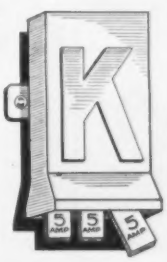
You can cut annoying outages to an absolute minimum without sacrificing safety with KEARNEY Specialized Fuse Links. They're precision-engineered with matched time-current characteristics that make possible easy and accurate coordination.

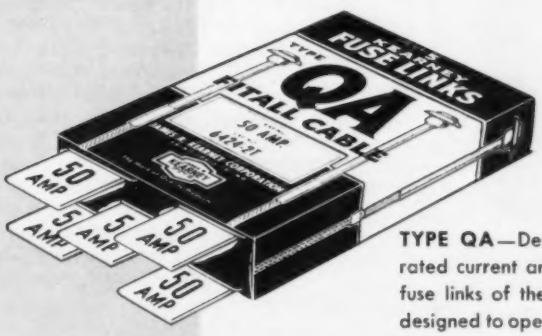
Proper selection of Kearney fuse links offers double protection—first, by guarding equipment against overload damage and, secondly, by avoiding needless load dropping and revenue loss.

Check the specialized protection listed here for KEARNEY Type KS, X, 200 and QA Fuse Links.

KEARNEY also offers Type K, the EEI-NEMA standard fast fuse link, and Type T—the EEI-NEMA standard slow fuse link.

All KEARNEY Fuse Links—no matter what the type—are color-coded to save time and prevent mistakes. The KEARNEY patented pull-tab Fuse Pak makes it easy for linemen to select the right link quickly and accurately—even with gloves on.





TYPE QA—Designed to open at a lower percentage of rated current and therefore will melt more rapidly than fuse links of the same ampere rating which have been designed to open 230% of rated load within five minutes.

JRK-326W

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify
JAMES R. KEARNEY CORPORATION ST. LOUIS MO. GUELPH, ONT.
The Mark of Quality

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HIGH CORROSION RESISTANT
Aerial Cable Clamps
Field tested and engineer approved on the basis of:
SIMPLICITY:
One unit — no separate clamp, spacer or pole plate.
VERSATILITY:
Can be used on both tangent and up to 90 degree angle structures.
CLEARANCE:
Eliminates chafing and abrasion of cable against pole.
COST:
Lower initial cost — fewer pieces to buy, inventory, handle and install.
Recommended by major cable manufacturers.
Prevent Pole Chafing of Aerial Cable!
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Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill., Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla., E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich.

RMEL

Pattern of the spring conference of Rocky Mountain Electrical League, to be held at the Shirley-Savoy Hotel, April 29-May 1, has been described by Ralph Hubbard, secretary-manager. It follows that of other previous spring conferences by having concurrent committee sessions of the accounting, engineering and the adequate wiring, information and sales and promotion committees on Monday morning and afternoon and Tuesday morning. A concluding general session will follow a joint luncheon on Tuesday. A joint luncheon will be held Monday noon also. The sociability hour and banquet will be Tuesday evening.

Accounting committee sessions will be chaired by E. C. Love, Public Service Co. of Colorado, Boulder. Engineering committee is headed by Howard Reader, Southern Colorado Power Co., Pueblo. Harold Rust, Colorado Central Power Co., Englewood, heads the adequate wiring committee. John N. Kerr, Public Service Co., is chairman of the information committee and John R. Dalsant, Public Service Co., heads sales and promotion.

Guy W. Thomas, Public Service Co., is general chairman for the conference and J. J. Dobel, Locke Department, G-E, heads the sociability committee. The conference will be presided over by David B. Hyer Jr., Southern Colorado Power Co., RMEL president.

Inspectors

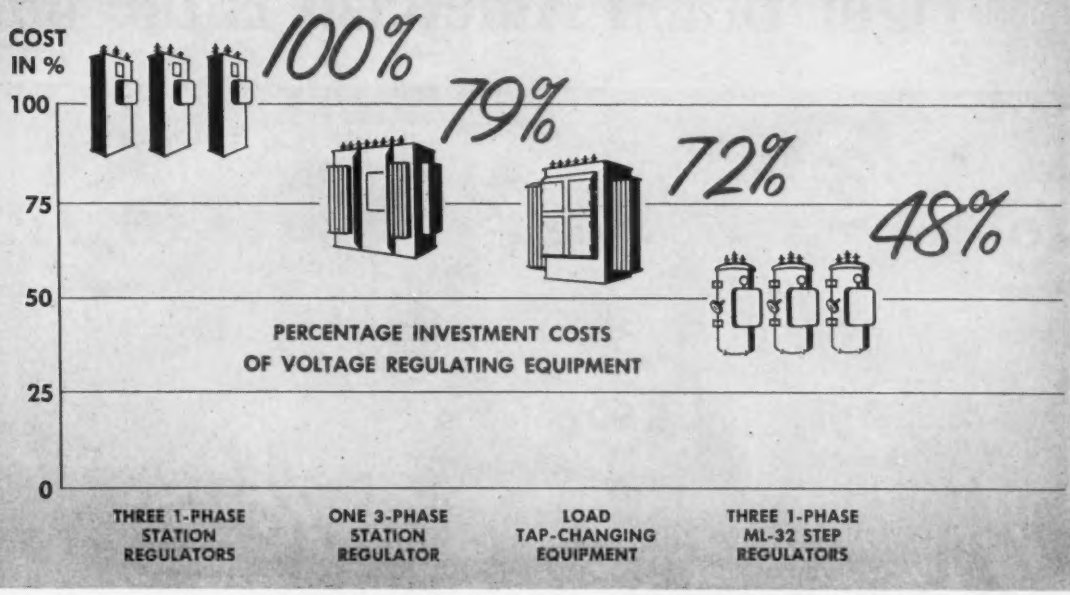
Berkeley, Calif., and its picturesque old Claremont Hotel in the foothills have been selected by the Southwestern Section, IAEI, as the place in which the annual meeting will be held Sept. 17-19. Arrangements are being made by Pat O'Leary, Berkeley assistant building inspector and chairman of the Northern California Chapter. A new type of workshop program is being organized for this meeting. It promises to be different from past programs and to offer the membership a fuller opportunity for benefiting from the discussion of codes and inspectors' problems.

NECA

A well-packed two-day business program and dessert of scenery and a concert will be afforded the National Electrical Contractors Assn., members and officers from the nine Western states in Districts 6 and 8 at the joint conference in Salt Lake City, May 3-5, according to Phil Robbins, District 8 vice-president. A brief outline of the program and entertainment features has been announced by Floyd N. Shipp, secre-

VOLTAGE REGULATORS

Profitable voltage regulation to help solve your distribution problems



Cost comparison shows ML-32 voltage regulators

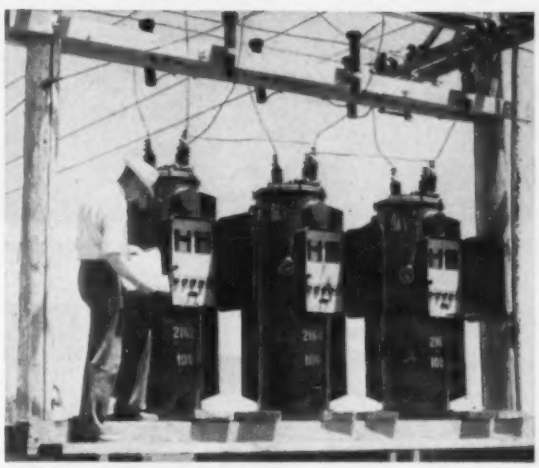
REDUCE REGULATOR INVESTMENT 50%

With new higher KVA ratings and increased current-carrying capacity now available, General Electric pole-type, single-phase Type ML-32 step voltage regulators make possible low-cost regulation in a wide range of applications, including substations as large as 8000 kva.

Compared with more expensive equipment, they can cut the cost of efficient regulation by more than 50 percent, as shown in the chart above. (This representative illustration compares the approximate relative costs of regulating a typical 3000 kva, 4 kv substation.)

Increased opportunities are thus offered to utilities not only to extend the use of voltage regulation, but also to benefit from increased revenues and savings through deferred investment in line rebuilding.

General Electric ML-32 regulators offer ±10% regulation in thirty-two 5/8% steps, in all standard voltage classes for circuits up to and including 14.4/24.9 kv. In addition, when installed on lines requiring only ±5% regulation, the G-E ML-32 step regulator will comfortably carry 160% of rated current (to a maximum of 400 amperes). For information on ratings and applications, get in touch with your local General Electric Apparatus Sales representative, or write for publication GER-1154 to Section 423-11, General Electric Company, Schenectady 5, N. Y.



ONLY THE ML-32 REGULATOR gives you ALL the most advanced features—including Class 1 control accuracy, control dial locking, "Bounce-free" Opti-life switching for increased contact life, up to 120 seconds time delay, internal by-pass protection and many other advantages. They add up to the most efficient, economical regulator of its type available today!

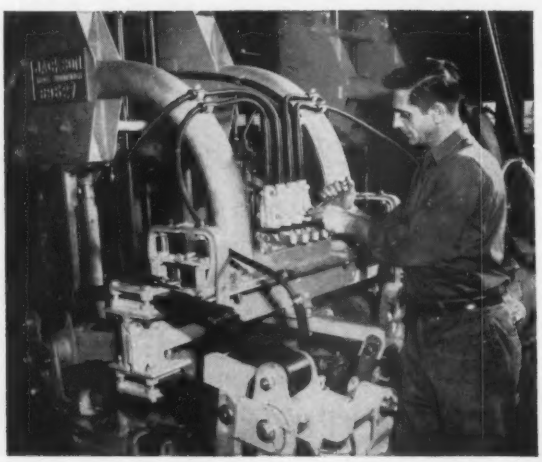
Progress Is Our Most Important Product

GENERAL ELECTRIC

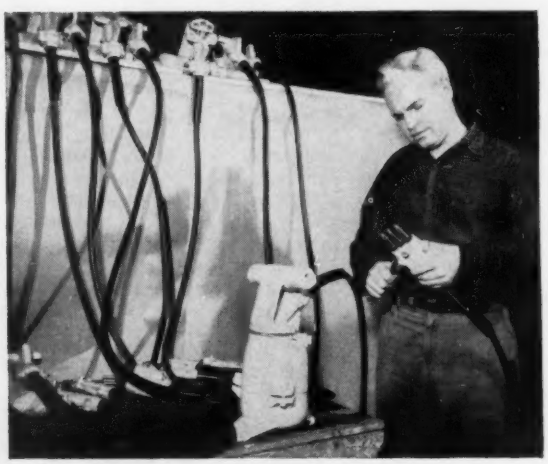
With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

"Tiger Brand Amerclad is the most

The completely self-contained Jackson Track Maintainer.



Tightening connectors. Machine delivers 4500, 2-ton blows per minute.



Assembling leads. Each vibrator delivers ¾ ton blow.

durable cable we've ever used"

says **ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Michigan**

MANY years ago, the executives at Electric Tamper & Equipment Co. found out that when railroads order a piece of machinery, they expect it to last a long time—without breakdowns. Since then, Electric Tamper has won a high place in industry by producing a line of the hardest-working, *toughest* track maintenance machines on the market.

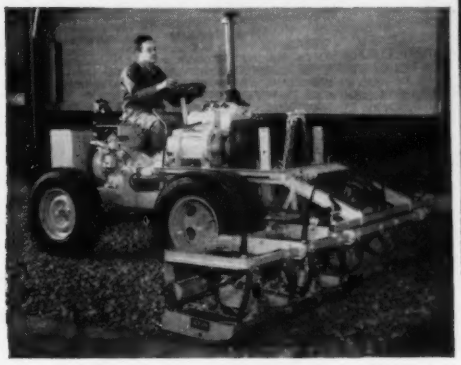
Leader of the line is the Jackson Track Maintainer, used for tamping ties. It has 8 powerful vibratory motors that drive 8 tamping assemblies. Each motor is powered with Tiger Brand Amerclad cable. The vibration and flexing (which are very severe) caused previous cable to crack until the jackets actually peeled away from the conductors. So they asked American Steel & Wire for advice.

Tiger Brand Amerclad was the solution. Finely stranded conductors soak up vibration and allow greater flexibility than ever before. The tough, well-cured jackets are impervious to oil, grease and the burning sun.

In the company's own words, "Tiger Brand cable is certainly superior to anything we have ever seen for this class of service. Its complete dependability under all service conditions has definitely helped us to maintain our good reputation in the field."

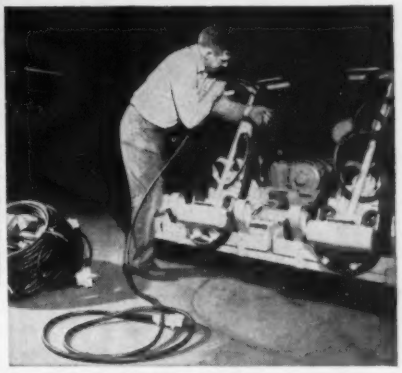
Do you want a *better* electrical cable—engineered for your equipment? Just call your American Steel & Wire representative.

The Jackson Multiple Compactor for consolidation of granular soil.



Hand Vibrospade. Cable usually drags on the ground.

Small compactor. See why they need durable cable?



AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
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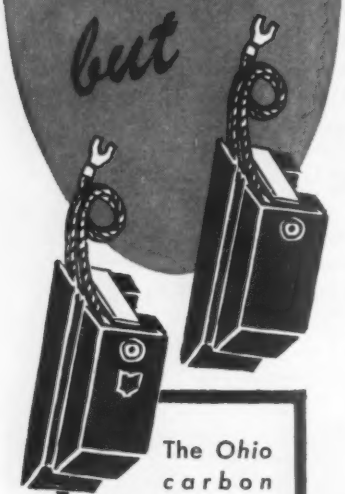
UNITED STATES STEEL

"LOOK ALIKES" but



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tary-manager, Utah-Idaho Chapter, NECA, the host.

Opening with a luncheon Thursday noon, May 3, at Hotel Utah, for both men and women, the first business session will be held that afternoon. Oliver J. Burnett Jr., president; Paul Geary, executive vice-president; E. R. "Al" Cornish, research and education director; and Howard P. Farley, sales promotion director, will be present and make addresses on NECA programs and policies. That evening a special concert will be given at the famed LDS Tabernacle by the choir and organ. Robbins is a member of the world renowned LDS choir.

Separate breakfast sessions for District 6 and 8 will start the Friday morning program, continuing until a men's luncheon at noon. A joint business session will be held that afternoon. The evening is open for personal gatherings.

Saturday morning the line constructors will have a breakfast session, followed by a business general session terminating at noon to allow the afternoon for guided tours. Tentative plans call for a trip to Bingham open pit copper mine, and the electrolytic copper refinery. The banquet and sociability hour will be on Saturday evening. The ladies' program is being arranged by wives of the Utah members.

Carl Ladenberger, So. Calif. Edison Co., takes the gavel from retiring president Aubrey LaForce, Axelson Mfg. Co., to be the president of Electrical Maintenance Engineers Assn. of Southern California

1956 Association Meetings Scheduled

April

5-7—**Electrical Maintenance Engineers of So. Calif., Industrial Show,** Shrine Auditorium, Los Angeles

11-13—**Northwest Electric Light & Power Assn., Engineering and Operating Section,** Hotel Vancouver, Vancouver, B. C.

11-13—**Institute of Radio Engineers,** regional conference, Hotel Utah, Salt Lake City

11-13—**Illuminating Engineering Society,** South Pacific Coast Region conference, Hotel Mark Hopkins, San Francisco

17-18—**PCEA, Administrative Services Section,** Sheraton-Huntington, Pasadena

19-21—**IES,** Pacific Northwest Region conference, Davenport Hotel, Spokane

24-29—**San Diego Bureau of Home Appliances,** spring fair, Balboa Park

26-28—**IES,** Intermountain Region conference, Hotel Utah, Salt Lake City

29-May 1—**Rocky Mountain Electrical League,** spring conference, Shirley-Savoy Hotel, Denver

May

3-5—**National Electrical Contractors Assn.,** District 6 & 8 conference, Hotel Utah, Salt Lake City

10-12—**Northwest Public Power Assn.,** Engineering & Operating Section, Wenatchee.

14-16—**PCEA,** annual convention, Las Vegas

21-23—**NWEL&PA, Business Development Section,** Benjamin Franklin Hotel, Seattle

21-23—**NWEL&PA, Personnel and Safety Section,** Benjamin Franklin Hotel, Seattle

June

21-23—**NWEL&PA, Accounting & Business Practice Section,** Portland, Multnomah Hotel

25-29—**American Institute of Electrical Engineers,** summer and Pacific general meeting, San Francisco

September

10-12—**International Association of Electrical Inspectors, Northwestern Section,** Salt Lake City

17-19—**IAEI, Southwestern Section,** Claremont Hotel, Berkeley

24-28—**NECA,** national convention, San Francisco.

October

1-3—**National Association of Electrical Distributors,** Pacific Zone annual convention, Westward Ho Hotel, Phoenix

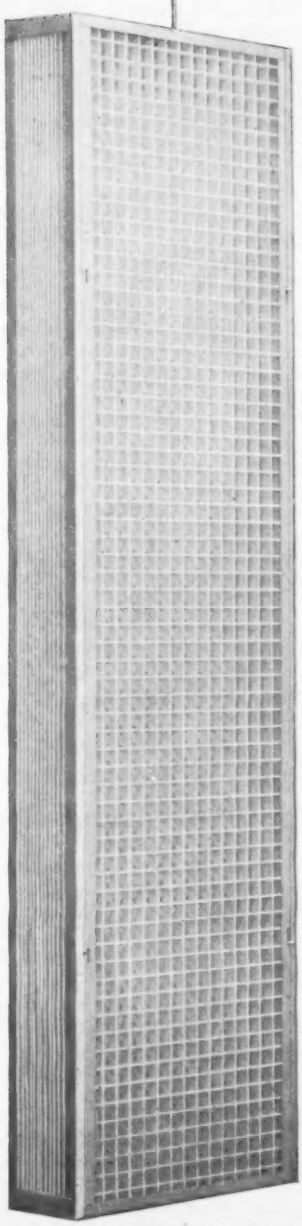
7-10—**RMEL,** annual convention, Broadmoor Hotel, Colorado Springs

November

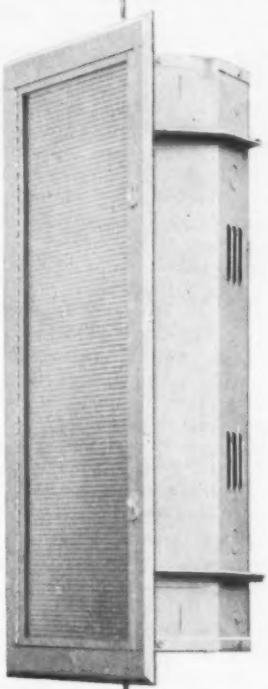
23-28—**San Diego Bureau of Home Appliances,** annual appliance show, Balboa Park

CONVEYING NEW STANDARDS OF QUALITY

Through use of modern industrial mass production techniques, Sunbeam Lighting Co. sets a still higher quality standard for the lighting industry. The latest and most highly perfected Bonderite process and electrostatic paint finishing equipment have been installed. The Bonderite treatment produces a superior corrosion resistant, paint-adhering surface to the metal. This, combined with electro-static application of enamel finishes greatly increases the durability, reflectance efficiency and appearance of Sunbeam Visionaires®. Additional assembly lines and a thoroughly integrated conveyor system increases our capacity to provide quicker, more efficient service. Complementing this production expansion, we have also augmented our design and engineering staffs to bring new concepts of modern lighting to the industry.



Extra-shallow PLM1880 series with miniature-celled plastic louver



Recessed 5600 series showing improved rigidizing members

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THIS MONTH'S NEWS

FPC Can't Rule on Rates Fixed by Long-term Pact

The Federal Power Commission's interpretation of the Federal Power Act in regard to electric and natural gas rates was upset by recent rulings of the U. S. Supreme Court.

In a case carried to the Supreme Court by FPC and Pacific Gas and Electric Co., the court ruled that the Federal Power Act does not authorize electric utility companies to make unilateral increases in power rates fixed in long-term contracts. A second ruling applying to natural gas was substantially the same.

The decision was the climax to an attempt by Sierra Pacific Power Co., Reno, to invalidate a 28% increase in electric rates asked by PG and E and authorized by FPC. Sierra Pacific has been paying the higher rate under protest since 1953.

Justice John Marshall Harlan, writing the court's unanimous decision, stated that FPC may not "impose on a public utility a rate producing less than a fair return. But," Harlan said, "this does not mean that a utility may not itself agree by contract to a rate producing less than a fair return, or that if it does so, it is entitled to be relieved of its improvident bargain."

Where this happens, Harlan said the FPC's sole concern is whether the contract rate is "so low as to adversely affect the public interest—as where it might impair the financial ability of the public utility to continue its service, cast upon other consumers an excessive burden, or be unduly discriminatory."

The contract in question originated in 1948 when PG and E offered Sierra Pacific Co. a contract for power at a special low rate in order to keep the utility as a customer. Power from Shasta Dam was available at the time.

In 1953 PG and E filed with FPC to increase the rate to Sierra about 28% and FPC approved on grounds that the return from the contract was only 2.6%, that PG and E was entitled to 5.5%, and that the increase would bring PG and E's return to only 4.75%.

The Supreme Court turned the case back to the FPC for such further action as the FPC "may deem desirable." Presumably, this means that FPC must now decide whether the contract price is so low that it has an "adverse effect" on the public interest.

In the meantime, Frank Tracy, president of Sierra Pacific, has said the company will take "whatever action becomes necessary" to recover extra payments it made to PG and E since 1953.

Ironically, Pacific Gas and Electric Co. may use the similar natural gas ruling as a basis for recovering more than $20,000,000 from El Paso Natural Gas Co. rate increases granted by FPC in 1953 and 1955.

Seattle Can Raise Dam On Skagit River Project

Seattle City Light has been authorized by FPC to build a higher dam at the intake of its Gorge hydroelectric power plant on the Skagit River.

Original plans were for installed capacity of about 575,000 kw, but the amendment allows an increase to about 621,000 kw. Cost is estimated at $14,750,000.

Raymond Enos, left, and Art Gilbert of Salt River Power District, are credited with saving lives when they policed several hundred bystanders away from a 12,500-v hot line that had been knocked down after an auto crash into a power pole. The two men rushed to scene but not could not save occupants

Flood-Drought Extremes Forecast for This Summer

Water supply forecasters are predicting everything from Columbia Basin flooding to a below normal supply in the southern California coastal area this spring and summer. San Diego shortage may be critical.

In between the two extremes is a good possibility that a two-year critical water shortage in the Denver area may be relieved by a mountain snowpack that is 50% deeper than the 50-year average.

An ominous note is sounded in the Pacific Northwest by the U. S. Weather Bureau hydrologists, who are predicting "historically high flooding" in some reaches of the Columbia River.

"The volume of snow in many river basins is so great that streams will be almost certain to get out of banks sometime during the runoff period," reports Anthony J. Polos, U. S. river forecaster at Portland.

Polos is forecasting a crest of 25 to 28 ft for the lower Columbia at Portland and Vancouver which would inundate low docks and pasturelands, and rise to the edge of most dikes.

In California the forecasted April-July runoff of major rivers ranges from 112% of normal for the Kern to 185% of normal for the Feather. Most of the rivers will be running off at about 155% of normal.

Delivery of Generators Delayed by Westinghouse

Effects of the long Westinghouse employees' strike are being felt in Washington state power developments.

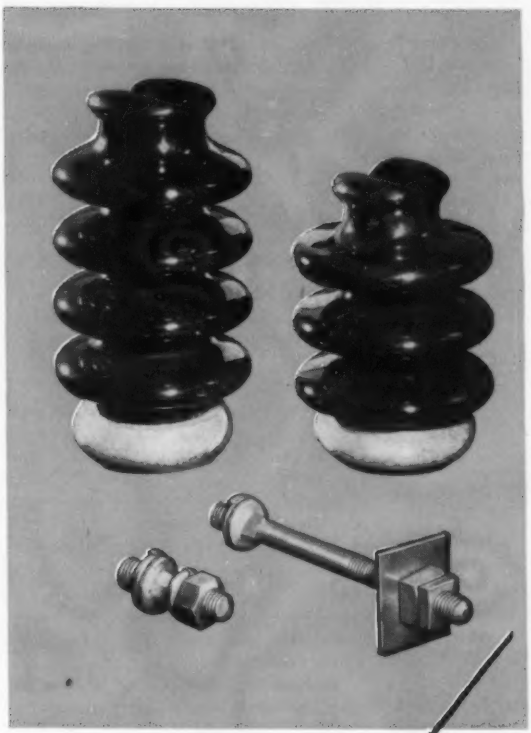
A 90,000-kw generator for Seattle City Light's Ross power plant has not been delivered, though the scheduled date was March 1. It is "highly unlikely" the unit will be delivering power by Oct. 1 as planned, according to John M. Nelson, executive assistant superintendent of City Light.

The fifth 64,000-kw unit for Chief Joseph Dam has not been delivered either. The Corps of Engineers had scheduled 1956 installation of this generator and three other Westinghouse units for the project.

NOW!

LAPP LINE POST PERFORMANCE

for your distribution lines



The Lapp Distribution Post is available in units of two sizes, the over all heights being 7" and 9". Separable studs . . . of any desired length. In addition, a special low-priced galvanized steel pole top bracket is offered specifically for use with these insulators. With either unit, it develops the full 1500 lb. cantilever strength at the top of the insulator.

New Lapp Distribution Post insulators are "baby" Lapp Line Posts—and priced in the range of distribution insulators. At duty up to 25 Kv, they offer the trouble-free kind of operating service that has been characteristic of Lapp Line Posts.

SOLID ONE-PIECE PORCELAIN. The body is a solid porcelain, machine-finished all over including conductor and tie wire grooves. Base is externally attached and studs are interchangeable—any required length being available.

FOG-TYPE. Multiple short petticoats, characteristic Lapp Fog-Type design, provide an exposed uniform leakage path and self-cleaning feature—most efficient for duty in contaminated atmosphere.

LIGHTNING- AND MECHANICAL-ATTACK RESISTANT. Short sturdy petticoats—such as have been proved by nearly 25 years of service on Lapp Line Posts—provide greatest protection from damage by arcover and attack by stones or bullets.

NO CRACKING. The porcelain, held in the large-area low-intensity grip of its cemented-on base, can be loaded only in compression. No internal bursting forces can develop—permanently free from cracking.

PUNCTURE-PROOF. Solid electrical porcelain from conductor to base—no internal conductive pins, or even air space. Completely puncture-proof.

RADIO-FREE. The Lapp Post, by design, is inherently and permanently free from television or radio interference—requires no treatment or coatings.

WRITE for full description and specifications, Lapp Insulator Co., Inc., Le Roy, N. Y.

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uprates to 5 kva!

There's lots of life in your old distribution transformers yet! Just let your local G-E Service Shop replace the old cores and coils with new factory-built units of higher kva capacity. Your transformers are returned good as new. There are 31 G-E Service Shops throughout the country—one near you. 431-33

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GENERAL ELECTRIC

Research Lab Contracts Go to West Coast Firms

Reports from General Electric Co. are that contracts connected with the atomic electric plant to be built in the Livermore-Pleasanton area in California will be let to West Coast firms whenever possible.

The project, being sponsored jointly by General Electric and Pacific Gas and Electric Co., will cost about $3,000,000 to $4,000,000, according to an Atomic Energy Commission estimate. For the first time, all costs will be borne by private companies. The AEC estimate has not been confirmed by G-E or PG and E.

Installation of the 5,000-kw experimental reactor is only part of G-E's activity in the new location. The company purchased 1,600 acres of land to accommodate an entire multimillion-dollar atomic laboratory for the development of "peaceful use of atomic energy," according to Francis K. McCune, vice-president and general manager of the atomic products division.

One important initial project will be support work on the 180,000-kw, all-nuclear power plant which G-E will build for Commonwealth Edison Co. and the Nuclear Power Group Inc. near Chicago. PG and E is also a member of this group, as is Bechtel Corp., San Francisco.

Package Bidding Shaves Priest Rapids Dam Cost

Although prospects for sale of power from the proposed Priest Rapids project of Grant County PUD are still undecided, the PUD has received a favorable bid for construction of the project.

By using a single contract method, which includes supplying all materials and equipment as well as construction, the PUD received a low bid of $91,878,625 from Merrit-Chapman & Scott Corp. of New York. Engineers' estimate of the cost was $120,000,000 for the first part of the two-dam project, which was expected to cost $360,000,000 total.

In the meantime the PUD is preparing new contract agreements to show to prospective buyers of the power. So far the seven utilities interested have balked at having the PUD reserve all the power for its own use at the end of 50 years.

Litigation brought by Paul G. Ellis, an Ephrata, Wash., contractor, is underway and is a threat to the project. He is claiming the PUD cannot make plans to sell power outside Grant County.

Two Power Companies Face Criminal Charges

Idaho Power Co. and Portland General Electric Co. are both facing criminal charges from Oregon's attorney general.

Idaho Power's Brownlee project on the Snake River and PGE's Pelton on the Deschutes are proceeding without having state hydroelectric permits, although both have applied for them.

Attorney General Robert Y. Thornton, a Democrat, contends that application by the companies for state permits subjects them to state jurisdiction. Both have received FPC approval.

District attorneys in the counties where the two dams are to be located were instructed by Thornton to make investigations, and to institute criminal proceedings if construction had started.

Half-Billion Project Planned for Wyoming

Two Wyoming companies have started feasibility studies of about $500,000,000 worth of electricity and natural gas projects in the state's Green River Basin.

Rocky Mountain Corp., which owns or has under option more oil and gas leases in the basin than any other firm or individual, and Technical Industries Corp., its affiliate, are considering the development program.

The project calls for development of natural gas resources and a pipeline to St. Paul, Milwaukee and Chicago, and also about 1,000,000 kw of steam-generated electricity for sale in the same markets.

Industrial development of the immediate area is also being considered.

Thermal-Hydro Project Studied by B. C. Firm

A combined thermal and hydroelectric expansion program under study by British Columbia Electric Co. is destined to add more than 336,000 kw generating capacity to the electric supply of the lower mainland and Vancouver Island South over the next five to six years.

The program includes a 97,000-kw thermal electric station for peaking purposes and four new units for the Bridge River generating plant with an aggregate capacity of 239,000 kw.

It is reported to be the largest single expansion program in the 59-year history of the company and will cost about $50,000,000.

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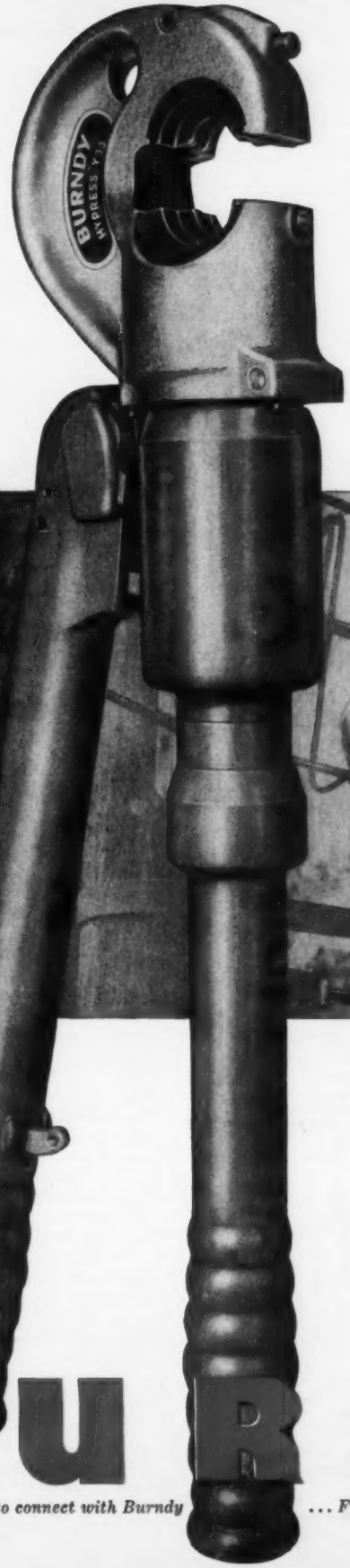
Y35 HYPRESS



all BURNDY compression connectors for overhead lines may be installed with the Y35 HYPRESS including

- CRIMPITS
- HYSPLICES
- DEADENDS
- ELTAPS
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- BYTAPS
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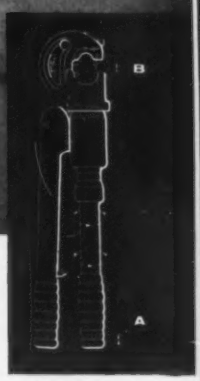
SIMPLIFIED DIE INSERTION — Identical interchangeable head and ram dies easily inserted and locked in position so that HYPRESS can be moved along connector without movement of dies.



QUICK RAM ADVANCE — Clockwise rotation of handle (A) moves die up to grip connector (B). Installation is completed by pumping until built-in overload valve clicks open. Trigger returns die to pre-set position.

Burndy developed and produced the first portable hydraulic HYPRESS in 1938. Experience and field usage since that time has made these features possible:

- Lightweight — weighs only 12 pounds
- Head Rotatable 180°
- Neoprene Insulated Body and Handles
- Crimping Die Release Trigger on Handle
- Sealed Hydraulic System

For further details or demonstration, contact your Burndy representative or write Burndy, Norwalk, Connect. — Toronto, Ontario for instruction manual.

BURNDY

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Earth Boring Equipment for All Types of Trucks

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U.S. Patent No. 2,336,965.

Derrick raised by simply engaging the winch.

Vertical position—winch rotation reversed.

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Tacoma Suffers Setback On Cowlitz Legal Fight

Plans of Tacoma City Light to build Mayfield and Mossyrock Dams on the Cowlitz River were given another legal body blow in March when Judge Charles T. Wright ruled against introduction of additional testimony.

The judge had indicated he would take testimony in connection with proposals by the city to include a portage on the river in plans for the project. Instead, a formal order charging that the city is proceeding illegally with construction of the development was accepted. It would also direct that an injunction dated Oct. 7, 1955, remain in effect until a date to be decided on. The formal order was presented by attorneys of the state game and fish departments.

The city can proceed with construction of Mayfield Dam until July 1 so long as it does not interfere with the river bed except to build a cofferdam.

The state game and fish departments are using a 1909 law against municipalities interfering with navigation by building power projects. According to the city's attorneys, the rights to the project could be sold to a private utility, which in turn would not be affected by the law.

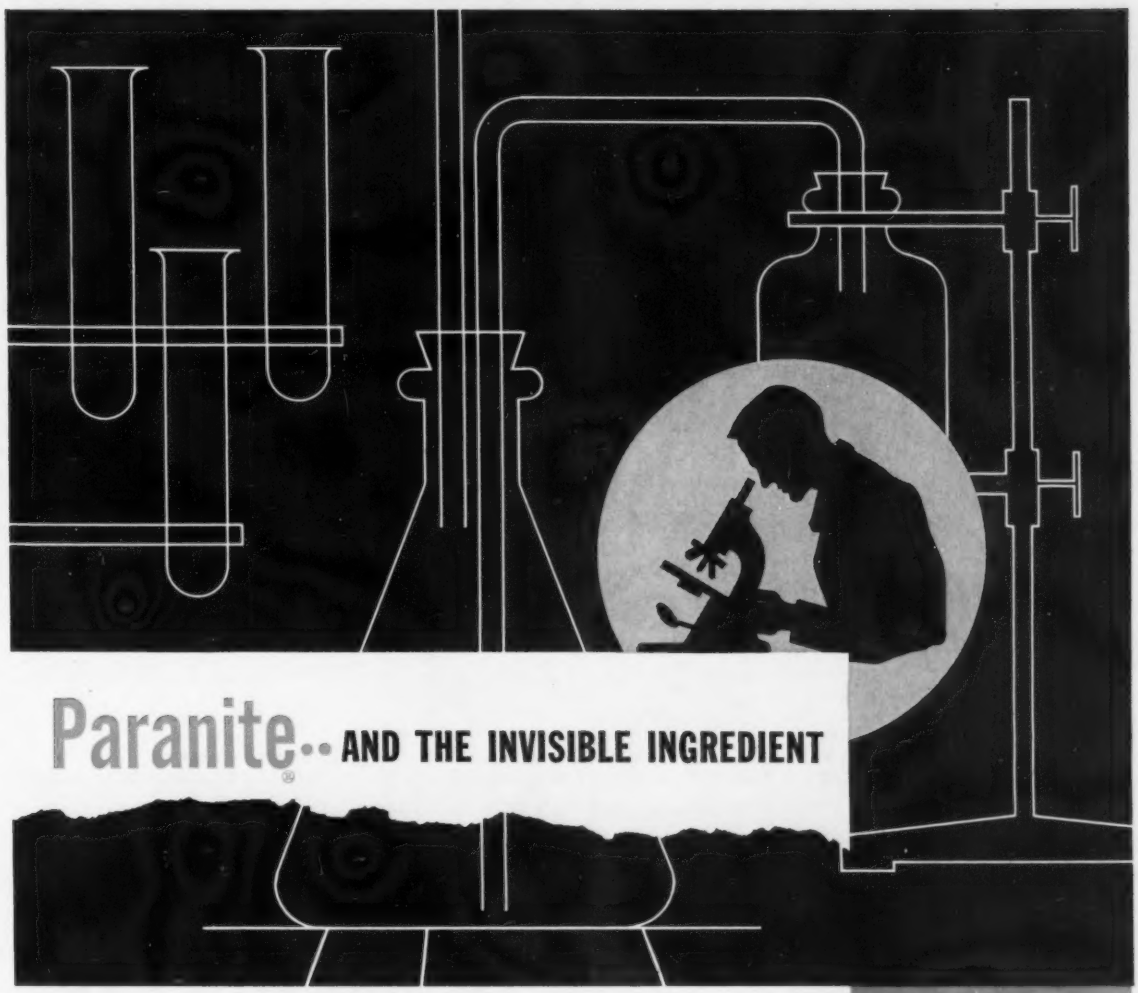
Denver Works Exchange Of Power for Water

The Denver Water Board is entering the power generation business to help with a solution of its water problems.

A 3,000-kw hydroelectric plant will be constructed at a new dam at Williams Fork reservoir. Power generated will be given to the Bureau of Reclamation in exchange for water from the Blue River. Another plant of 17,000-kw capacity is also being considered by Denver officials to be located at one of two possible locations in the Denver water system.

The agreement with the bureau gives Denver rights to Blue River water. It specifies that the federal government may fill its Green Mountain reservoir with Blue River water to its full capacity of 154,645 acre-ft once a year. Denver in return provides the government with power equal to what would have been generated by the water.

• **Pacific Gas and Electric** Co. has received approval of the California Public Utilities Commission to construct a fourth generating unit at its 255,000-kw steam plant in San Francisco. The new unit will have a name plate rating of 156,250 kw.



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● Electrical wholesalers and contractors coined a phrase decades ago expressing their confidence in Paranite products: "If It's Paranite, It's Right!" This reference by the trade became so common that in time the company adopted it as the Paranite slogan.

The privilege of enjoying such confidence didn't just happen. It was the direct result of the determination of everyone at Paranite to produce a better product each day than the day before, if humanly possible. This desire to achieve perfection has given Paranite products an "extra" that you cannot see ...or feel...and is truly an *invisible ingredient!*

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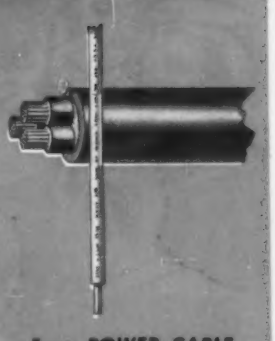
So specify Paranite . . . and be assured that every foot of wire and cable will be as nearly perfect as human hands can make it—utilizing modern equipment and cautious testing. This is the *invisible ingredient* working silently at Paranite . . . to your advantage! True today as in the past; "If It's Paranite, It's Right!"



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Strand is terminated here (no looping required)

1 Since PLP Guy-Grips eliminate looping, strand saving of 12 feet or more per guy results. **SAVING: $.67 per guy**

2 Substitute ¼" Extra High Strength Strand—rated 6650 lbs. PLP Guy-Grips make this possible since they hold the full rated strength of E.H.S. Strand. The following strand savings result (current cost of ⅜" galvanized strand is $2.24 per guy while ¼" E.H.S. costs $1.36 per guy)*: **SAVING: $.88 per guy**

TOTAL STRAND SAVING ALONE: $1.55 per guy

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PP&L Orders Generator For Wyoming Station

Although plant location has not yet been decided on, Pacific Power & Light Co. has placed orders with General Electric Co. for a 100,000-kw turbo-generator and other equipment for a Wyoming steam electric plant.

The order amounted to $5,000,000 and was placed before plant location in order to get into G-E's production line-up.

Areas being considered for the plant include Lake DeSmet and Glenrock, both of which have coal supplies.

The company has also been granted permission to extend power facilities to the Cottonwood Creek oil field area in north central Wyoming. Primary customers will be oil pumping stations, but some private customers are expected. Wyoming Public Service Commission granted the authority after Big Horn Rural Electric Co. withdrew an application to serve the area.

Intervention Asked On Lewis River Job

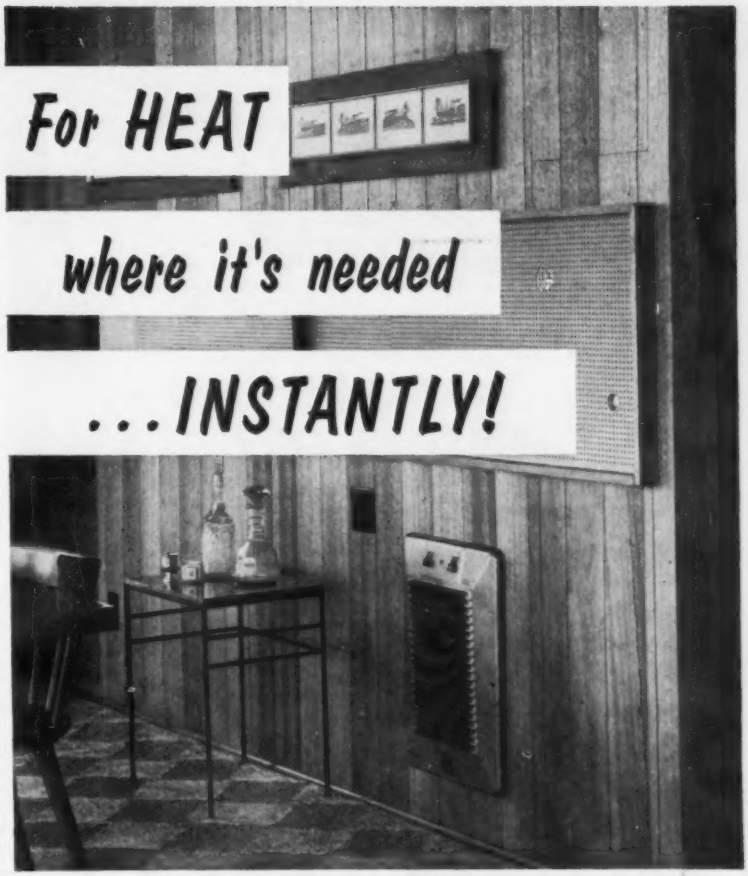
Partnership development of the Swift hydroelectric project of Pacific Power & Light Co. could result from a recent action of Cowlitz County PUD.

The Washington PUD has asked FPC for permission to intervene in PP&L's application for a license to build the 250,000-kw Lewis River project. Three alternates were proposed by the PUD: (1) that PP&L negotiate to make available a portion of the power to the PUD; (2) that FPC hold up the license until a partnership agreement for development of the site potential be concluded; (3) that FPC permit the PUD to file an application for a license to supersede that of PP&L.

D. R. McClung, Pacific Power executive vice-president, commented, "We are willing to consider any constructive proposal that will result in the addition of new power to the region's resources."

The Swift project site is upstream from PP&L's Merwin and Yale hydroelectric installations.

• **Desert Conquest,** a movie made by Salt River Power District, has proved to be very popular. In the five years since it was produced it has been shown to students, government bureaus, prisoners, civic societies, many other groups all over the nation and on television. Phil Clemons, who handles bookings of six prints, says "Believe me, every day has a surprise in the mail."



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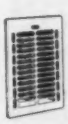
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Smog Charges Dropped Against Edison Plants

Charges of violation of smog-control regulations of the Los Angeles Air Pollution Control District against Southern California Edison Co. have been dismissed.

The company also received variances for operation and construction of generating units at El Segundo, Los Alamitos and Redondo Beach stations. The air pollution district had refused an operating permit for the first unit of El Segundo, which set off a series of hearings before the board of directors of the district. The board had earlier approved a construction permit for the unit.

Edison is now going to carry on a smog research program expected to cost $1,750,000. It will be headed up by Dr. Hagen-Smit of the California Institute of Technology, and is hoped to produce a means of reducing the sulphur content of fuel oil. A pilot plant installation will be constructed.

The program begins this fall.

UP&L Asks Approval Of Tax Accounting

Wyoming Public Service Commission has been asked to approve an accounting method for rapid tax write-off of Utah Power & Light facilities.

The method proposed by the company is to set aside the $164,391 yearly tax saving in a reserve account. After the plant concerned is depreciated on the books in five years, part of the money will be withdrawn each year until depreciation is normalized over the life of the plant.

Accelerated amortization has been approved for 80% of a $3,000,000 plant at Monticello, Utah.

Douglas County PUD Opposes Rocky Reach

The Douglas County PUD of Bridgeport, Wash., will file a protest with the Federal Power Commission against proposed construction of the Rocky Reach hydroelectric dam on the Columbia River by Chelan County PUD of Wenatchee, Wash., according to George Hamilton, president of the Douglas PUD.

"This is not to be considered an unfriendly act on our part," said Hamilton, but Chelan County PUD officials disagreed.

Douglas County PUD wants to build a dam on the Columbia at Wells, 41 miles upstream from the Rocky Reach site, or investigate downstream areas.

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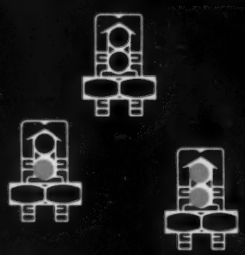

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Upper Colorado Passage Expected This Session

Congressional approval of an Upper Colorado River Basin bill—minus the controversial Echo Park Dam—is expected during this session by Washington observers.

A Senate-House conference committee is expected to work out existing differences between a Senate bill that includes Echo Park and a House bill that leaves the second-largest part of the project out.

Important to 10 Western private utilities is that the possibility of their inclusion in marketing plans for power is strong. The bill provides $145,000,000 for a complete transmission grid, but this would be considerably reduced if the utilities' cooperation offer is accepted. They offer to build lines to connect with a single backbone transmission line.

California Legislators Divide on Water Plans

Northern and southern California legislators girded for battle after Gov. Goodwin J. Knight asked for $5,160,000 for surveys and construction plans, acquisition of both the Oroville and San Luis dam sites, and purchase of some railroad and highway rights-of-way for the Feather River project.

Southern California legislators are opposed to Knight's request that the $900,000 appropriation for purchase of the San Luis dam site be held up until it is determined whether the federal government plans to build the project. They want state ownership without restrictions.

Another point of opposition is the controversial counties-of-origin state laws that reserve first rights to water for areas where the water falls. The sizable southern California bloc insists this matter of water rights must be settled before any other action is taken.

Commission Has Say Over Arizona REA Co-op

An REA electric cooperative has been brought under the jurisdiction of Arizona's Corporation Commission, setting a precedent in the state.

Trico Electric Cooperative, serving parts of Pima, Pinal and Santa Cruz Counties, was brought under commission supervision at the request of a group of customers who wanted rates to be controlled.

The commission also limited expansion of the co-op into areas served by other utilities.

A breakneck pace has been set for construction of Idaho Power Co.'s Brownlee Dam on the Snake River. Morrison-Knudsen has 500 men working three shifts, to be increased to 1,000

Bids and Contracts

• **British Columbia Power Commission** will receive an increase of $60,000,000 in its borrowing authority at this session of the provincial legislature. The increase will bring the total authority to $170,000,000.

• **Merrit-Chapman & Scott** Corp. of New York submitted the lowest bid for construction of the Priest Rapids Dam of Grant County PUD. Bid was $91,878,625. PUD engineers had estimated the cost would be about $125,000,000.

• **Kaiser Engineers Division** of Henry J. Kaiser Co. has been awarded a contract for design and construction of a 100,000-kw steam-electric generating plant for St. Joseph Lead Co. at Josephtown, Pa.

• **Guy F. Atkinson** Co., San Francisco, was apparent low bidder for the first step cofferdam of Ice Harbor Dam for the Corps of Engineers on the Snake River. Bid was $1,362,377.

• **Recent contract awards** announced by Bonneville Power Administration are as follows:

The Brandon Co., Vancouver, Wash., construction of 150,000-kva Keeler substation, for $179,011;

EMP Electric Ltd., London, supply lightning arresters, for $21,060;

L. B. Read, Portland, construction of 345/230-kv switchyard and 230-kv Keeler terminal position at the J. D. Ross substation, Vancouver, for $97,976;

W. L. Ridge Construction Co., Spokane, construction and removal of transmission lines at Big Eddy substation and vicinity, for $144,458;

Electric Transmission Equipment Co., Portland, supply bus and switch insulator stacking units, bid invitation 7,899, for $44,250;

Aluminum Co. of America, Portland, supply conductor and accessories, bid invitation 7,897, for $210,072;

General Electric Co., Portland, supply disconnecting switches, bid invitation 7,802, for $210,000;

Electric Transmission Equipment Co., Portland, supply bus and switch insulators, items 1-11 and 13, bid invitation 7,806, for $106,100;

Porcelain Products Co., Parkersville, W. Va., item 12, bid invitation 7,806, for $2,670.

• **Schwager-Wood** Corp., Portland, has received a $131,750 contract for electrical equipment for fishwater units at Corps of Engineers' The Dalles Dam.

• **Inland Construction** Co., Milwaukee, was low bidder with $78,700 for repair of the lower regulating outlets and construction of steel liners for them at Detroit Dam.

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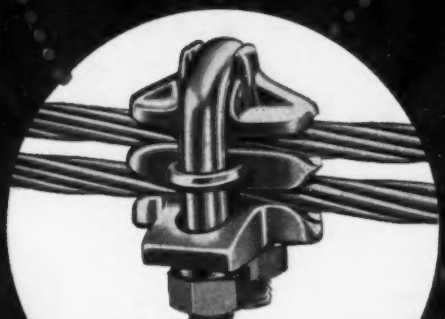

LCA-70 A.C.S.R. or Aluminum Cable to A.C.S.R. or Aluminum Cable
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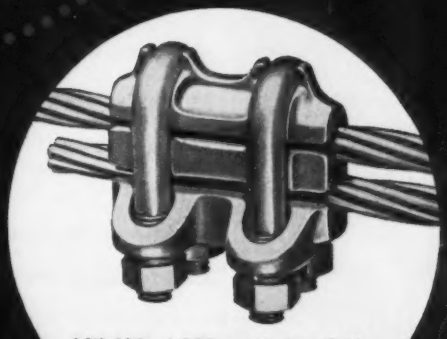

LCU-600 A.C.S.R. or Aluminum Cable to A.C.S.R. or Aluminum Cable
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Generator Failure Hurts Men in California Plant

Preliminary investigations indicate that the failure of a General Electric steam turbine at Pacific Gas and Electric Co.'s Pittsburg station occurred in the generator portion, according to A. D. Bragg of G-E.

The 165,000-kw unit failed during normal overspeed tests following a routine overhaul. It had been in service since 1954.

G-E has given top priority to investigation of the failure and has a five-man team from the large steam turbine generator department in Schenectady trying to solve the problem.

The large unit failed and set off an explosion about 8 p.m., March 18, injuring nine men.

PG and E spokesmen said it was not likely that the failure was caused either by the overhaul or the tests it was undergoing.

Two units in the four-generator plant remained in operation after the explosion, and no damage to the third was reported.

Merger Again Proposed Of Hawaiian Utilities

A new proposal to merge Kona Light & Power Co. and Hilo Electric Co. has been approved by both boards of directors of the Hawaiian utilities.

A previous attempt to merge was refused by stockholders last year because of the ratio of the stock exchange. In the new plan, Kona shareholders are offered 8,260 shares of Hilo stock in the exchange as compared with last year's proposal of 8,000, a money increase of about $34,000.

The merger has Hawaiian PUC approval.

Highest Voltage Line Energized on March 21

High voltage electricity began flowing into the 161-mile line from Chief Joseph Dam near Wenatchee, Wash., to Snohomish on March 21. Energized initially at 230 kv, the line is capable of carrying 345 kv, and will be stepped up by 1960.

The entire output of the four generators now on the line at Chief Joseph will go west of the Cascade Mountains over the new line, which is the third Bonneville has run through Stevens Pass.

• **The Washington State Supreme Court** will hear legal arguments concerning Tacoma's Cowlitz project on June 25.

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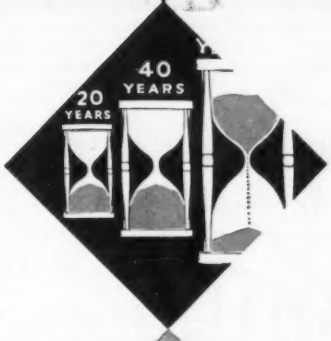
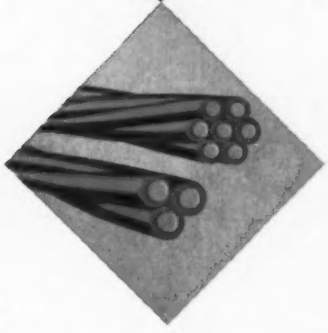


and throughout the entire life of the line...



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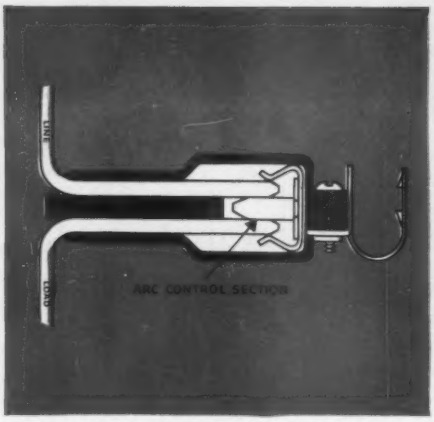

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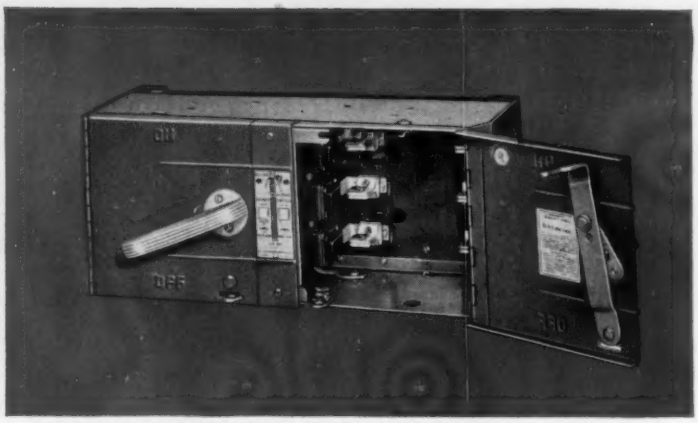

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YOUNG ELECTRIC & MFG. CO.
2134 Curtis St.
Denver 2, Colorado

SAFETY SWITCHBOARD COMPANY
910—89th Avenue
Oakland 21, California

BULLDOG ELEC. PROD. CO. OF LOS ANGELES
2885 E. Washington Blvd.
Los Angeles 23, California

NOTES ON THE TRADE

Thomas Industries Plant Dedicated at Los Angeles

Formal dedication of a new Thomas Industries plant at Los Angeles was held recently.

The new building will be West Coast headquarters for Moe Light Division and Star Lighting Fixture Co., as well as a manufacturing plant and warehouse.

An attractive feature of the building is a showroom that is to be available to architects, builders and distributors to show Thomas Industries products to potential customers.

• **Moe Light Division** of Thomas Industries Inc. has reorganized its sales section and promoted five former regional managers to divisional managers. Promoted to Western Division manager is **A. O. Grotenhuis,** who will supervise activities in the 11 Western states.

• **General Electric Supply** Co. has created a new Intermountain Region that embraces the former Denver and Salt Lake districts. Regional head, with offices at Salt Lake City, is **R. S. Belnap.** States in the region include Utah, Idaho, Montana, Wyoming, Colorado and parts of Nevada, South Dakota, New Mexico and Oregon.

• **Al W. Rockwell** has announced retirement from his position as Pacific Coast sales manager of Appleton Electric Co. to assume new duties as sales consultant. The company also announced the following appointments of executive field engineers: L. L. Ames, San Francisco; J. M. Humphrey, Denver; L. N. Kepler, Seattle; and W. A. Mundy, Los Angeles.

• **Linemen's Supply** Corp. of California, 2704 S. Hill St., Los Angeles, is a new electric utility service business of A. L. Dickson, president. The company will stock all kinds of linemen's safety equipment and related products, and is southern California and Arizona distributor for Buckingham Mfg. Co.

• **General Controls** Co. is constructing a new building for the San Francisco branch at Bryant and Fourth Sts. It will serve as sales office, showroom and warehouse.

F. L. "Hock" Hockensmith, Allied Industries, Los Angeles, demonstrates the new Remcon remote control switching system to architects at the Santa Barbara Electrical Show staged by the National Electrical Contractors Assn. and the International Brotherhood of Electrical Workers last month. It was an adequate wiring electrical show that attracted much attention from various industry groups

• **Square D** Co. announces that **Glenn Hunter** has been promoted to district manager of the Portland office and warehouse. **Stanley Wild** was appointed field engineer in the Portland district. Maurice Mann, Roger Keegan and Hugh Baldra continue in district sales, order and warehouse assignments, respectively.

• **Kaiser Steel** Co.'s fabricating division, Montebello, Calif., is now West Coast sales and service depot for Yale Cable King electric hoists. The arrangement is designed to provide Yale industrial supply distributors, crane and monorail builders with a convenient stock of electric hoisting equipment.

• **Frank K. Donnelly** Co., Seattle, has been appointed sales representative for J. F. Pritchard & Co. of California in the State of Washington. Products are cooling towers for air conditioning and industrial applications and package dehydration units for air and other gases.

• **Richard L. Erlin** has been appointed general sales manager of Kaiser Steel Corp.'s fabricating division plants at Napa and Fontana, Calif. **Elvan R. Babylon** is new manager of engineering sales for the company.

• **Yale & Towne** Mfg. Co. has named **L. W. Goldenson** manager of the San Francisco sales and service branch of the materials handling division. Temporary address is 563 Second St.

• **Square D** Co. has announced a $9,000,000 expansion program to be completed in the next 22 months. More than $500,000 are to be spent to expand its West Coast operations. The program, which includes a $3,000,000 Milwaukee plant, will be financed from company funds and will provide about 400,000 sq ft of new production space.

• **Zinc Controls Corrosion** is the name of a new 16-mm sound and color film available on free loan from the American Zinc Institute Inc., 60 E. 42nd St., New York 17, N. Y.

• **Valvate-Associates,** 7814 State St., Huntington Park, Calif., are now authorized distributors of Automatic Switch Co. solenoid valves.

• **Johns-Manville** has announced plans to build a plant near Stockton, Calif., to manufacture Transite asbestos-cement pipe products. The company has also signed an option on a large gypsum deposit near Las Vegas, Nev.

• **Bruce-Emmett** Co., Portland, Seattle and Spokane, has been appointed agent for sale of Pittsburgh Standard Conduit Co. rigid steel conduit, electrical metallic tubing, elbows, couplings and fittings. The territory includes Washington, Oregon, Montana and northwest Idaho.

• **Plomb Tool** Co. has acquired certain assets of Tubing Appliance Co., including machinery, tools, patents and inventories of TAC ratchet wrenches. Manufacture of the wrenches as Proto-Tac tools is underway at Plomb Tool Co.'s Los Angeles plant.

• **Edward H. Bastedo** is Northwest district representative, specializing in electrical conductors, for Kaiser Aluminum & Chemical Sales Inc. From his Spokane headquarters, he will work with electrical wholesalers in Washington, Oregon, Montana and northern Idaho.

• **Donald T. Elliott,** manufacturers' representative, has moved his operations to 1229 Burlingame Ave., Burlingame, Calif. Mailing address should include P. O. Drawer 589, and the new phone number is DIamond 4-2518.

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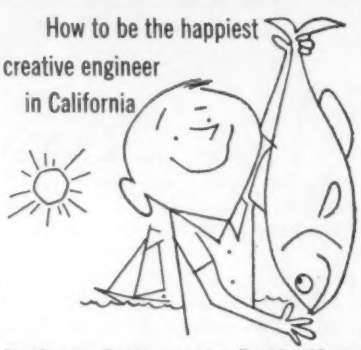

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Gibbons

General Manager's Post Given to R. F. Gibbons

Richard F. Gibbons is new general manager of the Gardner Transformer Division of Federal Pacific Electric Co. He was former manager of Air Switchgear Engineering, Pacific Switchgear Division.

Gibbons is a graduate electrical engineer of the University of Notre Dame, and did graduate work in metallurgy and electronics at Stanford University. He has been with the company since 1930, and before that was with Southern California Edison Co.

A resident of Saratoga, Calif., Gibbons has served as chairman of the high-voltage substation committee, and the Western regional substation subcommittee of AIEE. He is also a member of the California Society of Professional Engineers and Pacific Coast Electrical Assn.

• **Dudley J. Snider,** former northern California representative of National Electric Products Corp., is now district sales manager of the company's Michigan sales district.

• **Keith M. Noble** is now vice-president and general manager of Pacific Electric Motor Co., Oakland., and **James W. Allen** is secretary and manager of fabrication and repairs.

• **S&W Electric** Co., 2144 Welton St., Denver, now represents the **J. A. Weaver** Co. of St. Louis in four Western states. The territory to be covered includes Colorado, Utah, Wyoming and Montana.

• **McGraw Electric** Co. has purchased **W. E. Moore** Co. of Pittsburgh and four affiliated Pittsburgh concerns. Steel melting furnaces and electric and gas industrial dryers are products.

• **W. B. "Bucky" Harris** has been appointed field representative for the Los Angeles branch of General Controls.

New high school for a southern city...

WIRE BY PHELPS DODGE

This modern new Senior High School in Gainesville, Fla., one of the finest in the state, is smartly designed to handle both present and future student enrollment needs. One-third more students can be accommodated merely by adding extra classrooms to the present structure. The school's auditorium, gymnasium and cafeteria were constructed to provide for this future expansion of the student body.

To assure dependable, trouble-free electrical service at all times, Phelps Dodge wire and cable was specified and installed throughout this distinctive school.

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On every wiring job, large or small, where top quality materials, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge distributor!*

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QUICKLY Installed
TOUGH For long life

EVERSTICK ANCHORS

For new construction and maintenance —Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resilient, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

NEWS ABOUT PEOPLE

San Diego G&E Promoted Several Men Recently

Several promotions of San Diego Gas & Electric Co. employees have been announced recently.

Arthur R. Cox is comptroller, succeeding C. G. Watters, who retired. Cox is also an assistant treasurer.

Walter A. Zitlau has the newly created position of mechanical engineer. His duties include assisting management in planning, design, construction and initial operation of new generating facilities.

George E. Jenner, former chief design engineer, is now manager of purchases and stores. He succeeds William de Waard who retired. Joseph F. Sinnott takes Jenner's place as chief design engineer.

Edward J. Wright has been named assistant credit manager of the company. He will continue the duties of collection offices supervisor.

William de Waard, retiring from purchases and stores managership, has had 42 years with the company, and many years activity in the industry and associations.

• **Edward L. Jones** has been designated tool program coordinator of Pacific Gas and Electric Co.

• **Dr. Frederick E. Terman,** dean of the school of engineering and provost of Stanford University, has joined the board of directors of Stanford Research Institute as a member and vice-chairman.

• **P. M. Lemoine** has been appointed to the new position of chief accountant for Tacoma's Department of Public Utilities. He was formerly machine accounting supervisor for Tacoma City Light. He joined City Light in 1948 after 20 years with the Los Angeles Department of Water & Power.

• **Franklin Raglin** has been appointed superintendent of transportation for Public Service Co. of Colorado. Raglin, who joined the company in 1947 as a junior engineer in the department, succeeds **Elmer J. Graham,** retired.

• **Robert E. McMordie** is new chief engineer of British Columbia Power Commission. He comes to the job from the position of senior project engineer for Ontario Hydroelectric Power Commission, and before that was a structural design engineer with H. G. Acres & Co., Niagara Falls consulting engineering firm.

Cox

• **Geoffrey G. Woodward** of Vancouver has been appointed secretary of British Columbia Power Corp. and its chief subsidiary, B. C. Electric Co. Ltd. He had been assistant secretary since joining the firm in 1947.

• **Walter T. Lucking,** president of Arizona Public Service Co., has been selected Arizona's engineer of the year, and named vice-president of the Association for Applied Solar Energy.

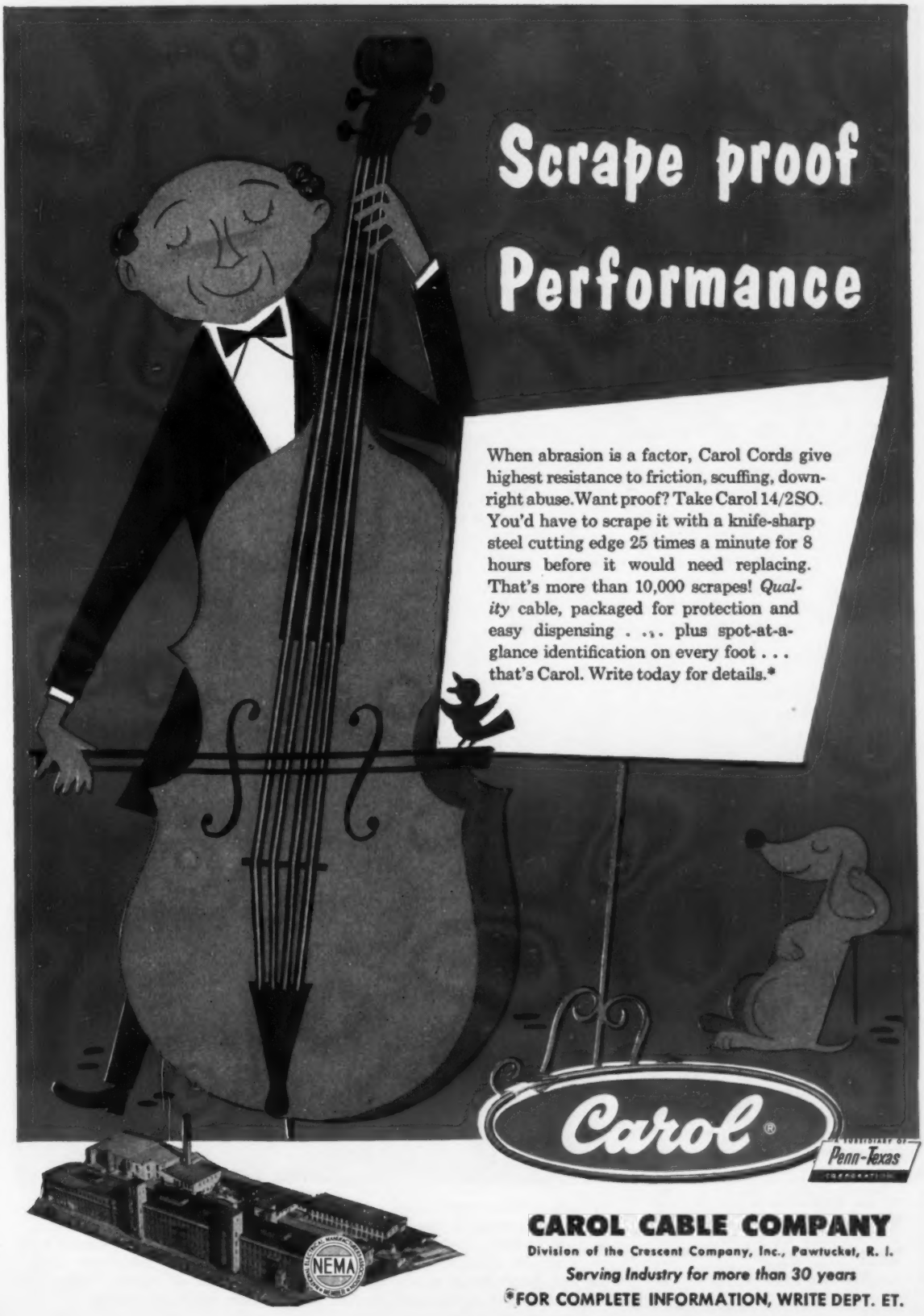
• **Ralph E. Grimes,** a founder and vice-president of **Columbia Electric Mfg. Co.,** San Francisco, has retired from service. He was with the company from its beginning in 1926.

• **Fred Groch** is new head of Portland General Electric Co.'s rate and research department. He succeeds **W. L. Sharp,** who retired, but who is continuing with the company as a consultant.

Deaths

• **Robert D. Hyneman,** 57, died in Seattle March 11. He had retired after 30 years of service with Graybar Electric Co. and then became Northwest representative for the Wesix Electric Heater Co. headquarters in Seattle. He was a member of the Electric Club of Washington for many years.

• **Roy Cederoth,** Magnavox district and regional manager in Portland for 22 years, died March 8 in a Portland hospital. He is survived by Mrs. Cederoth and four daughters.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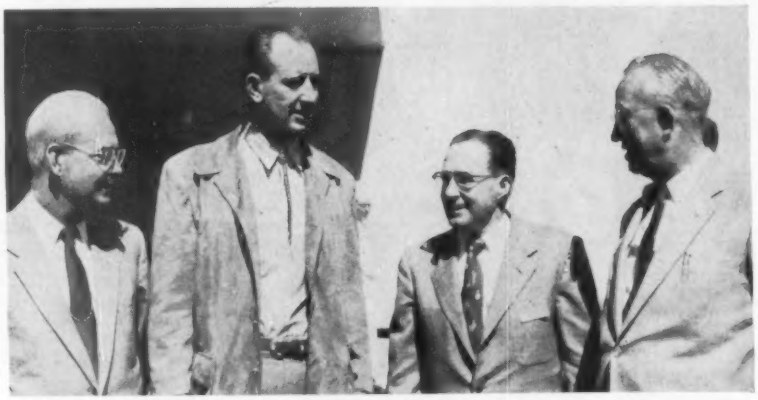
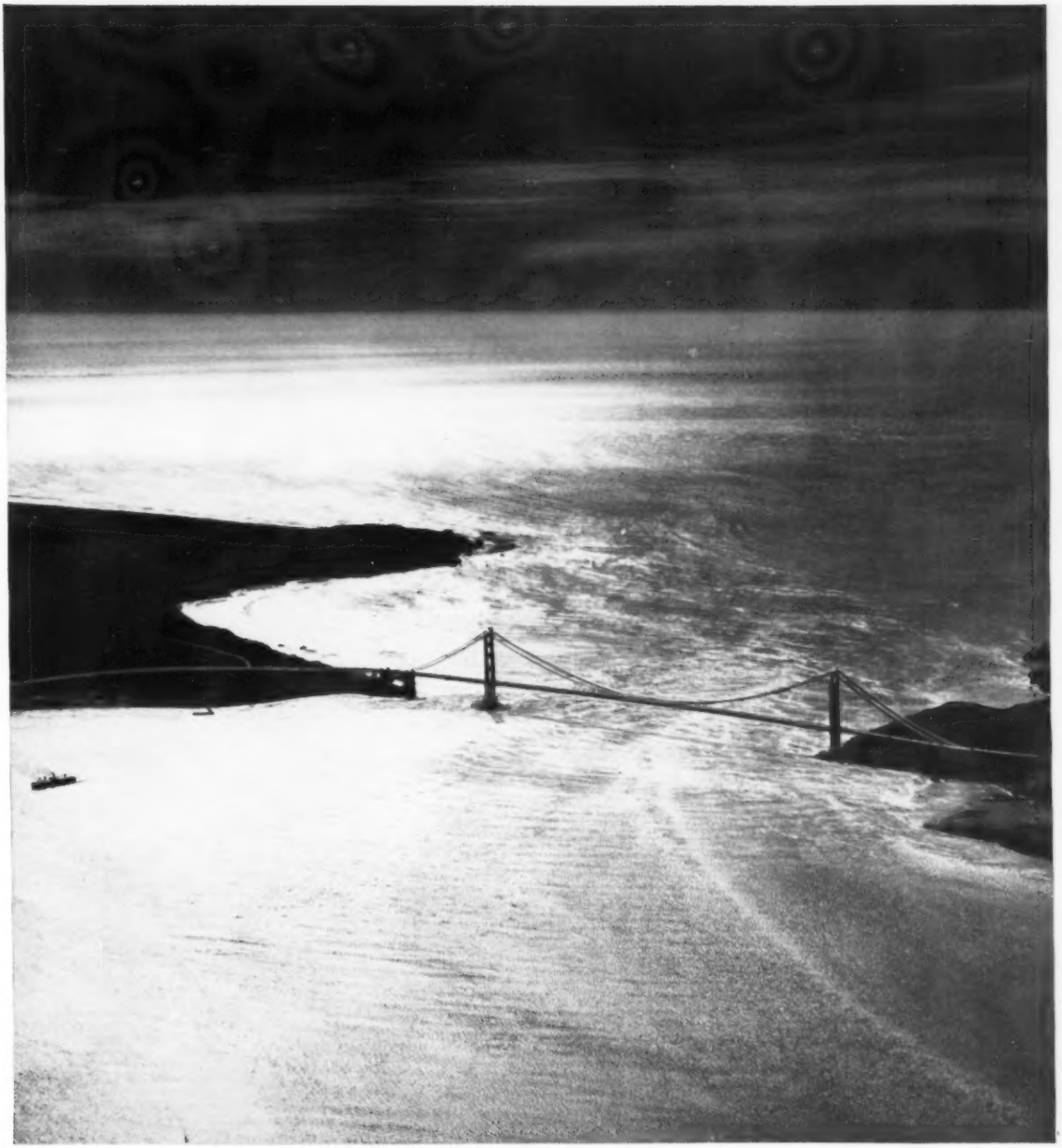
PROFILES

"Don't love 'em and leave 'em" is the advice of selling specialist Ben Franklin Bills of Chicago who is conducting a series of sales workshops under sponsorship of the Northern California Electrical Bureau. "Don't sell one appliance and stop; get a client, an account — not just a prospect." Definite ways of going about this were given in the course, as were patterns for selling seven different types from the Even-Minded Normal to the No-Minded Negative. Bills, whose dynamic personality and sound philosophy make his courses both popular and instructive, will give six workshops before he closes in Sacramento April 17-20



Live Better . . . Electrically was launched in Phoenix recently with a kinescope of the original telecast, and attracted about 300 businessmen. A typical group of electrical industry people attending are pictured here. They are, left to right, Russ Morrissey, manager of Mehagian's; Walter Lucking, president of Arizona Public Service Co.; S. A. Ward, manager of Salt River Power District; Marriel Hamilton, New State Electric Co.

New officers of the San Francisco area Bid Depository installed at the recent annual meeting are Fay Lemoge, Lemoge Electric Co., San Francisco, president; William Nagel, A. Neri Inc., Oakland, vice-president; Garth Chamblin, California Electric Construction Co., San Francisco, secretary-treasurer. In background, left, Conrad Abbett was president last year. Joseph Barnes, right rear, is a member of the board of directors. Clyde Chamblin, pioneer, gave an account of the early day association trials and triumphs



42 Golden Gates! Since the end of World War II, Pacific Gas and Electric Company has nearly tripled its capacity at a cost of $1,500,000,000. That's forty-two times the cost of the Golden Gate Bridge! And we're *still* expanding.

Fantastic? Not by California standards! For the area we serve is growing high, wide and handsome—and we're making sure we keep *ahead* of this dazzling growth.

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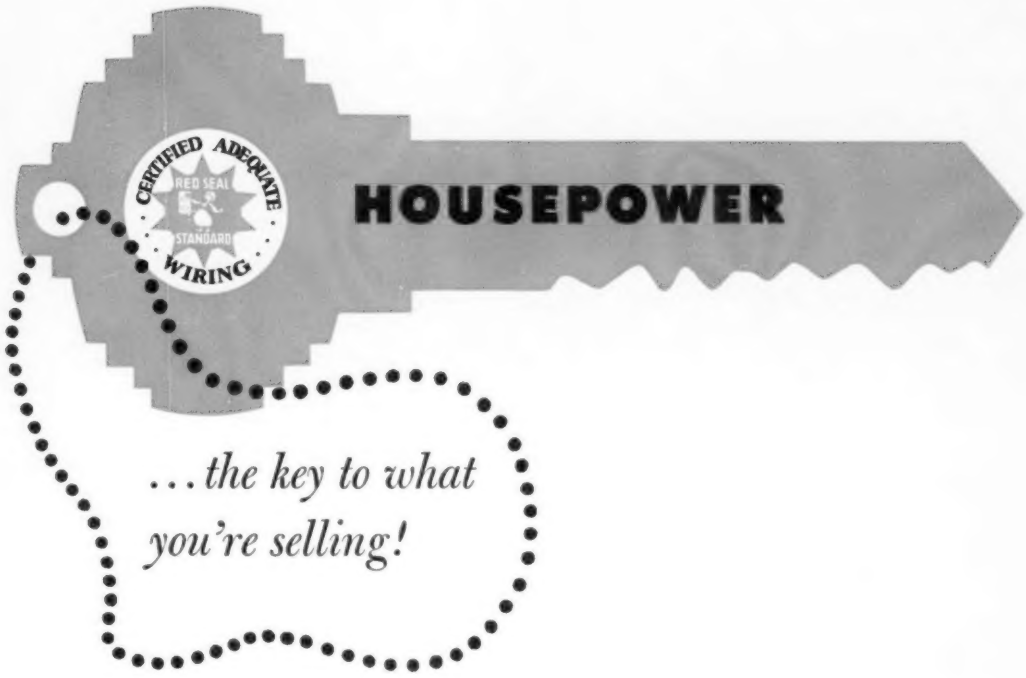

Planning to get a big boost in your business by taking part in the electric industry's great selling program? Then it will pay you to remember that adequate wiring—Housepower, that is!—is one of the essential elements. Sell it along with every appliance sale . . . to assure customer satisfaction, and to lay the foundation for the next sale, and then the next.

Your customers *need* Housepower, if they're to get full benefit from the things you're going to sell them. When they *have* it, your selling job is half done!

One of PCEA's major activities is the planned program for the promotion of Certified Adequate Wiring. You can get full details on it—and on other valuable PCEA activities—from either office. There is no cost or obligation.

PACIFIC COAST ELECTRICAL ASSOCIATION

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